Anniversary Issue

Computing NOW!

APRIL 1984

Canada's Personal Computing Magazine

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MM70247

Survey of 150 Computers

- Macintosh Review
- IBM Assembler
- CP/M on the 64
- Apple Clef Hanger



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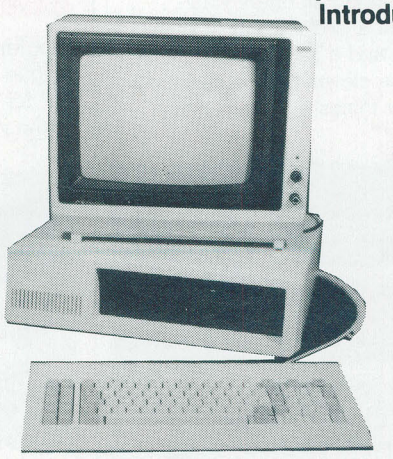
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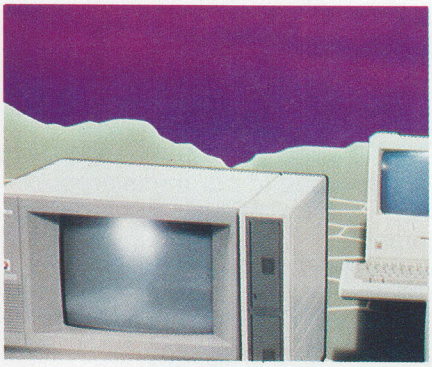
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Advertisers Index

Arkon Electronics Ltd. 45
Astris Science Inc. 81
Atlantis Software 47
CompuCanada 6
Computer Fair 89
Computer Junction 58
Computerland Canada Inc. 23
Computerway Inc. 77
Computron 15
Electronix Control Systems 79
Exceltronics 2
Franklin Computer Canada 96
Frantek Software Distributors Inc. 63
Gentec Computers Inc. 81
Hal Computer Company 61
Hayes Microcomputer Products (Canada) Ltd. 64, 65
Hi-Tech Computer Systems 17
Infomag Inc. 53
International Marketing Services 94
J.L.S. Computers Inc. 51
JSOFT 79
Lanpar Ltd. 21
Micro Bazzar 35
Micro Computech Electronics Ltd. 40, 41
Micro R.G.S. Inc. 48, 49
Mid Canada Software 25
Orion Electronic Supplies Inc. 11
Pacific Rim Electronic Imports Inc. 95
Parts Galore Inc. 56, 57
Peripherals Plus Inc. 66
President Computer Corp. 69
Quentin Research 90
Radio Shack 29
Seiko Time Canada 39
Semi-Tech Microelectronics Corp 55
Supertronix Inc. 31
Surplustronics 3
TEO Computers & Peripherals Inc. 74
Universal Computer Systems 91
Xerox Canada Inc. 7

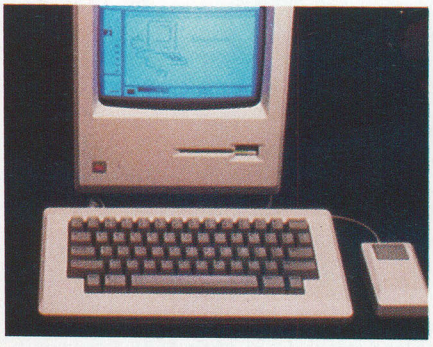


8
150 Computer Survey

It's a frightening to contemplate the megatons of packaging material which would be unleashed if all of these systems were unwrapped in the same room. Check out our bi-annual survey of everything micro.

36
Add CP/M to your 64

The Data 20 Video Pak offers your Commodore 64 a professional eighty column screen and a new processor to run CP/M. It's a clever bit of work, but there are a few things nybbling at its toes.



42
Macintosh Review

Late one night amidst the rain and the creatures of the shadows came there two beings from the ad agency carrying a Macintosh. The mystery of the ages was about to be revealed...

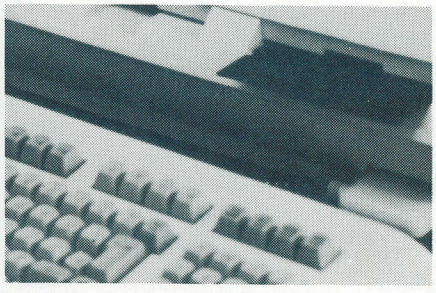
50
Three Packages

There are business software packages everywhere. However, these three provide you with advanced word processing and planning capabilities at a reasonable cost.



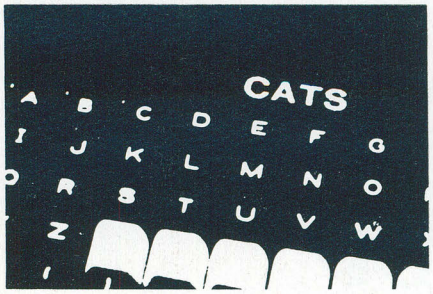
59
Assembler on the IBM

Programming the IBM PC in its native tongue feels a lot like asking a Liberal MP for facts. Herein we look at a few of the rudiments of this quest.



67
CBM Printer Interfacing

Your Commodore computer probably doesn't like most of the printers on the planet. However, with this article and a bit of work you can achieve compatibility.

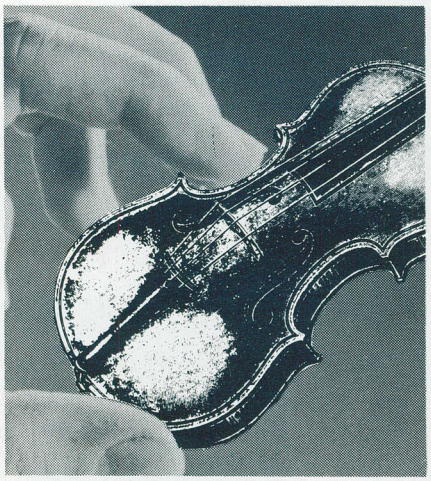


80
The Toronto Stock Exchange

Ahem... well, yes, this is a computer magazine and we wouldn't have even mentioned the ol' TSE except that they have the most amazing collection of micros running the place. Really... see for yourself.

70
Clef Hanger for the Apple

Computer music hath charms to soothe the savaged brain. This program takes the simple Apple clone and turns it into... a sort of composer for people who listen to their alarm watches, actually.

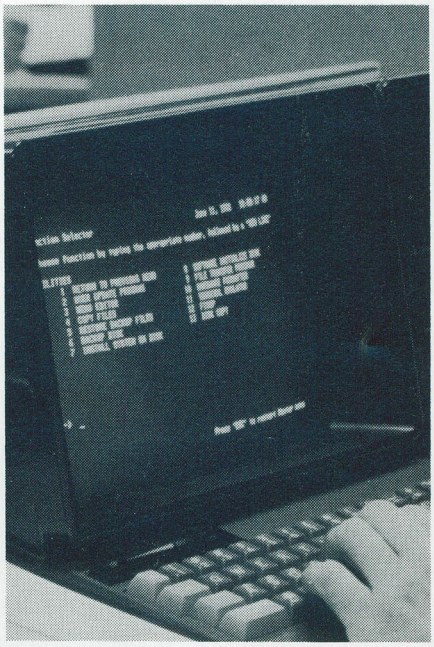


76
SID Symphony

The Commodore 64 has a silicon maestro sleeping inside it. Wake it up and it will play beautiful music at your TV. Rapping sharply on the case will not work.

78
DFX Review

A splendidly clever bit of software. DFX allows the sending of data from one Apple to another over the phone lines... without having to worry about Ma Bell flaking it out.



84
Converting the Heathen Program

You've been dying for a game of computer beagle shooting and, at last, you've found a program to do, it. However, alak, it's written for another machine. Here's an approach at adapting software for your personal reality.

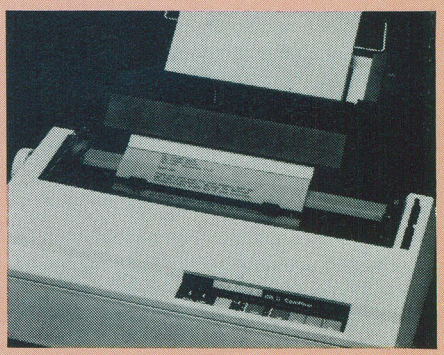
Departments

Toot 6
IBM Software 33
Subs and Coffee 72
Magazines 83
ETI 85
New Products 88
Product Mart 92
LIST! 94

Next Month in Computing Now!

Search For Wordstar

The best part about Wordstar is that one is forever finding new uses for its countless lesser known features. Next month we'll be looking at its miriad search and replace capabilities and how they can be adapted to a number of otherwise difficult situations. Globals, globals everywhere...



Printers

There are printers in all forms and manifestations out there and all of them have been bred through countless generations for the one glorious moment when you run screaming from the computer store in hysterical confusion upon trying to choose one. Defeat them.

Turbo Pascal

As language packages go, Turbo Pascal from Borland is one of the best deals in the cosmos. It comes with a super fast and tight complier and a Wordstar like editor. The code is transportable between most popular eight and sixteen bit machines and it's all very cheap.

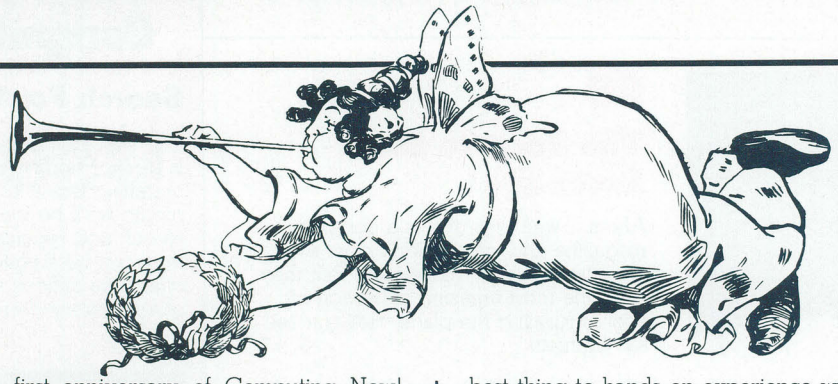
Telecommunications on the IBM

Making your IBM PC talk to the outside world is a really interesting project. Whether you are up for just calling a few bulletin boards or utilizing telecommunications for business you'll be surprised at just how foolishly simple using the serial port of a big blue beast can be.

Hexes And How To Throw Them

Computer mathematics and numerology permeates the applications of micro computer systems. In fact, understanding hexadecimal and binary isn't that tricky... next month we'll have a look at the rudiments of it so that even if you can barely turn the thing on you won't have to be afraid of numbers that start with "C".

The Life and Times of CN!



This month marks the first anniversary of Computing Now! magazine. In our first year we've grown from having no circulation at all... the usual state when one begins publication... to having over twenty two thousand readers across Canada. We've had features on virtually all of the new systems that have been announced and looked at areas of computer use which ranged from micro computers for children right up to sophisticated programming techniques.

When we started CN! twelve months ago we felt that computers had really arrived. We've come to realize that that wasn't true then and probably isn't now, either. The advances in technology and human engineering that are poised to become state of the art stagger the consciousness.

A lot of what goes into CN! is based on our access to the latest developments in computer design. We offer you the next best thing to hands on experience with the latest hardware and software. In fact, many users who buy systems read CN! first because we've gotten pretty good at knowing what to look for in an emerging system.

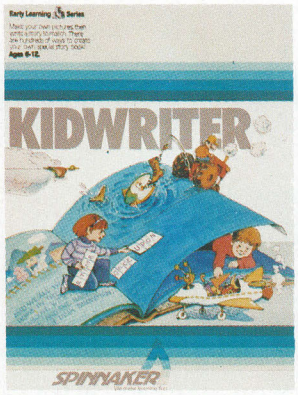
However, Computing Now! is also a magazine about using your computer. In its pages you'll find programs to use, patches for popular software and all sorts of things to make your computer get up and dance. What we're most proud of at CN!, however, is that we've managed to keep our publication human and understandable. We've worked very hard to make the editorial of CN! comprehensible to all levels of users. English is still our favourite computer language.

If you're new to Computing Now!, have a look at our index for Volume one. It's on page 93 of this issue.

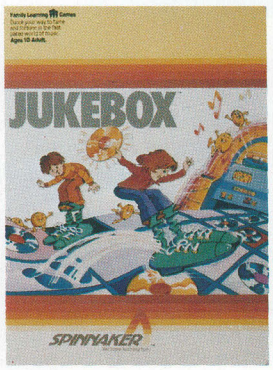
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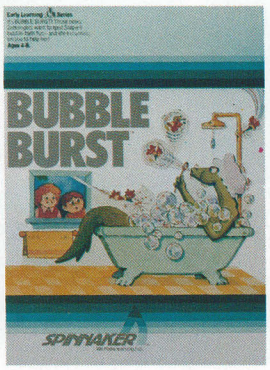
The Newest from Spinnaker



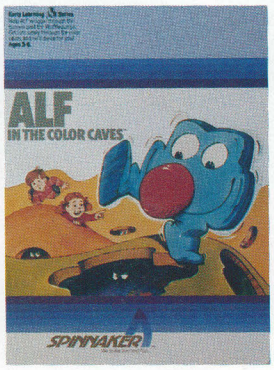
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150 Computer Survey

Remember when life was easy? When the number of microcomputers on the planet could be counted on the fingers of one hand? Dark ages, those...

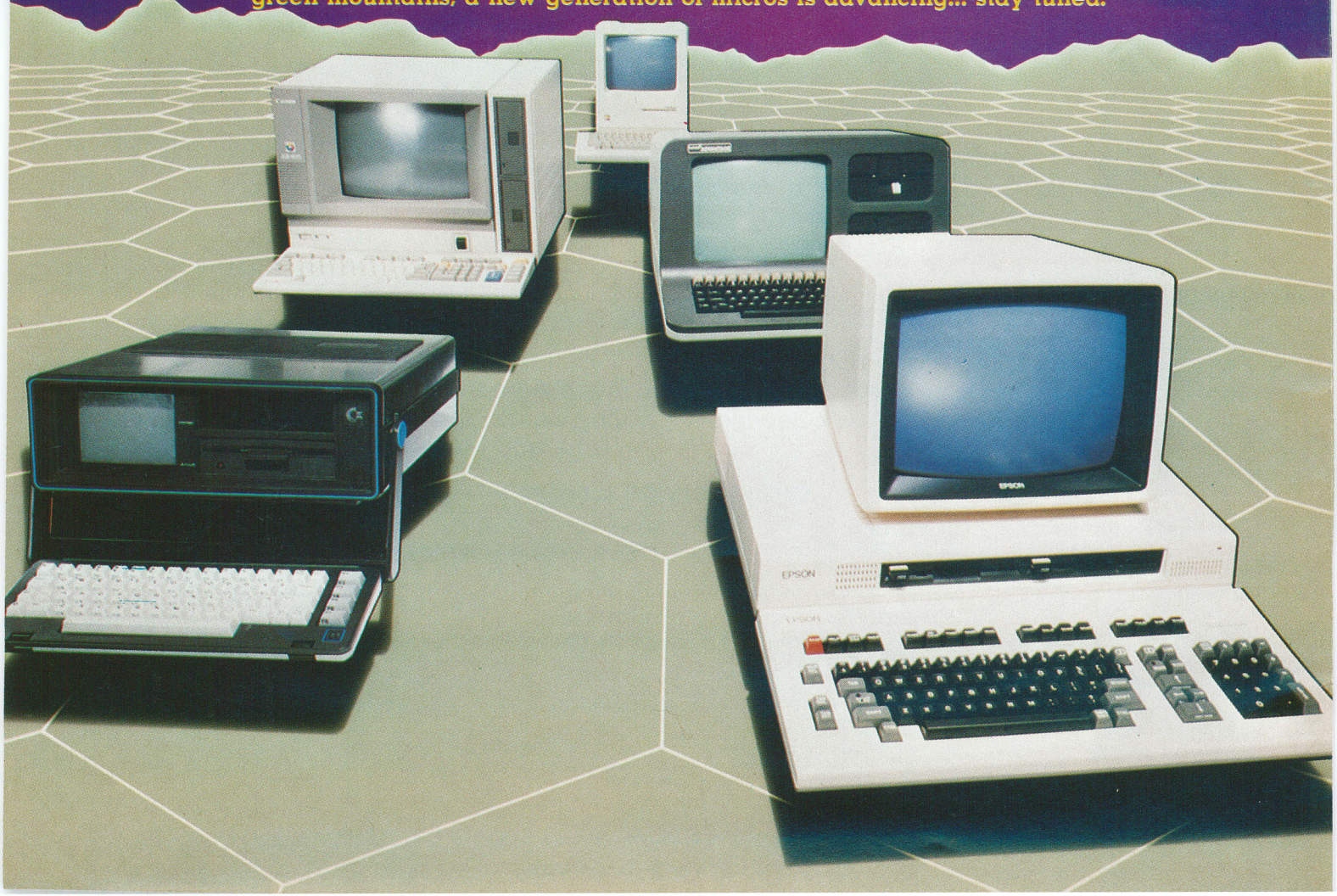
Something happened. Call it a computer baby boom or simply prosperity, but the whirlwind upheavals and downfalls in the industry have necessitated a survey of what's available in Canada roughly every six months. The very pages you now look at may be outdated in weeks.

We've seen micros go from eight bit processors boasting one to two K of RAM to mighty thirty—two bit giants with up to one megabyte of integrated RAM to chew on. Thinking about what tomorrow may bring could be a sobering experience.

One hundred and fifty computers are surveyed here... actually, a few more. Three times as many as reviewed last April and fifty more than CN!'s September coverage are listed. Their possible applications range from simple, easy to use learning tools to burly business systems that can practically run offices themselves.

In looking them over, with their ergonomically styled injection molded plastic cases attracting your orbs, you may find yourself mentally subtracting from your life savings and checking up on your credit limit on old Visa bills. Whether you're looking for a starter system, to upgrade from your present one, or just want to see old friends and new arrivals, this survey is presented for you.

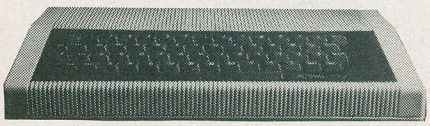
Listen... do you hear that rumbling? Somewhere beneath that purple sky, behind the green mountains, a new generation of micros is advancing... stay tuned.





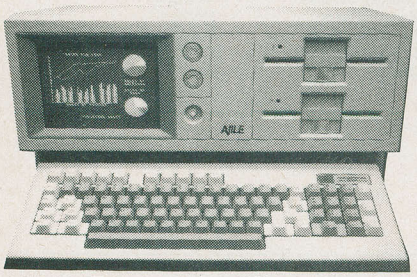
Actrix Portable

Operating System:	CP/M
Processor(s):	Z80A (optional 8088)
RAM:	64K
Printer I/O:	Two serial, one parallel and one IEEE
Disk Drives Inc.:	Two SS DD drives
Screen Format:	80x25
Graphics:	126 graphics characters
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Perfect Writer/Speller/Calc/Filer; Fancy Font
Software Available:	Extensive
Weight:	33 lbs.
Primary Market:	Business
Manufacturer:	Access Matrix Corp.
Available From:	Kobetek Systems Ltd.
Suggested Retail:	$3195.00
Other:	Built-in 8x9 dot matrix printer



Acorn Atom

Operating System:	BASIC
Processor(s):	6502
RAM:	2K
Printer I/O:	Optional serial or parallel
Disk Drives Inc.:	Optional
Screen Format:	32x16
Graphics:	256x192
Sound:	Yes
Colour:	Optional
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Lots
Primary Market:	Home
Manufacturer:	Acorn Computers
Available From:	Gladstone Electronics
Suggested Retail:	$99.95; 12K RAM model $199.95



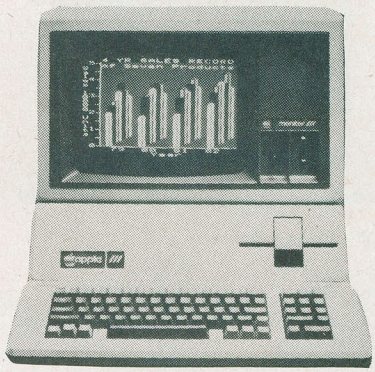
Ajile

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	S and P
Disk Drives Inc.:	One 5 1/4" DS DD floppy
Screen Format:	80x25
Graphics:	640x250 pixels
Sound:	Programmable
Colour:	No
Keyboard:	Detachable
Software Included:	In:Scribe, Multiplan
Software Available:	Lots; IBM compatible
Weight:	9.6 kg.
Primary Market:	Business
Manufacturer:	Bytec-Comterm
Available From:	Anderson Jacobson
Suggested Retail:	$4285.00



Apple //e

Operating System:	BASIC
Processor(s):	6502A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional
Screen Format:	40x24: Optional 80X24
Graphics:	280x192
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business and home
Manufacturer:	Apple Computer
Available From:	Local dealers
Suggested Retail:	$1875.00



Apple /// +

Operating System:	BASIC
Processor(s):	6502B
RAM:	256K
Printer I/O:	Serial
Disk Drives Inc:	One 5 1/4" DD floppy
Screen Format:	80x24
Graphics:	560x192
Sound:	Optional
Colour:	Optional
Keyboard:	Integrated
Software Included:	SOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local dealers
Suggested Retail:	$4295.00; business unit $6995.00
Other:	Business unit has 5 megabyte hard drive, monitor and Catalyst software

Apple Lisa 2/5

Operating System:	Integrated icon software
Processor(s):	68000
RAM:	512K
Printer I/O:	2 serial, 1 parallel
Disk Drives Inc:	One 3 1/2" floppy, one 5 megabyte hard disk
Screen Format:	Variable
Graphics:	720x360
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	N/A
Software Available:	LisaCalc/Write/Draw/Graph/Project/List
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local Dealers
Suggested Retail:	$6495.00
Other:	Can run Macintosh software



Apple Lisa 2

Operating System:	Integrated icon software
Processor(s):	68000
RAM:	512K
Printer I/O:	2 serial, 1 parallel
Disk Drives Inc:	One 3 1/2" microfloppy
Screen Format:	Variable
Graphics:	720x360
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Macintosh Operating System
Software Available:	LisaCalc/Write/Draw/Graph/Project/List
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local dealers
Suggested Retail:	$4995.00
Other:	Can run Macintosh software

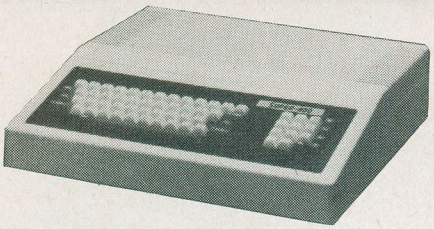
Apple Lisa 2/10

Operating System:	Integrated icon software
Processor(s):	68000
RAM:	512K
Printer I/O:	2 serial, 1 parallel
Disk Drives Inc:	One 3 1/2" floppy, one 10 mb hard disk
Screen Format:	Variable
Graphics:	720x360
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	N/A
Software Available:	LisaCalc/Write/Draw/Graph/Project/List
Primary Market:	Business
Manufacturer:	Apple Computer
Available From:	Local Dealers
Suggested Retail:	$7995.00
Other:	Can run Macintosh software



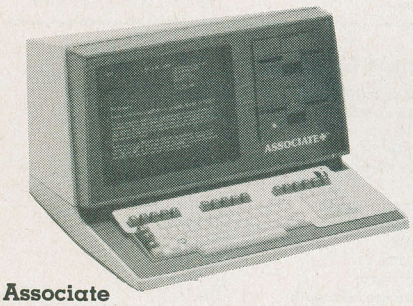
Apple Macintosh

Operating System:	Macintosh Operating System
Processor(s):	68000
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc.:	One 3 1/2" drive standard
Screen Format:	
Graphics:	512x342 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Graphics and word processing
Software Available:	Soon to be extensive
Weight:	17 lbs.
Primary Market:	Home, business, educational
Manufacturer:	Apple Computer Corp.
Available From:	Apple Canada
Suggested Retail:	$3595.00; $4295.00 with Imagewriter printer
Other:	Visually-oriented; mouse included



Arcomp Super 400

Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4 ' floppy
Screen Format:	40x24
Graphics:	280x192
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business or home
Manufacturer:	Arcomp
Available From:	Chen-Koll
Suggested Retail:	$689.00
Other:	Apple compatible



Associate

Operating System:	CP/M or MS-DOS, CP/M-86
Processor(s):	Z80A or optional 8088
RAM:	128K
Printer I/O:	3 serial, one IEEE, optional parallel
Disk Drives Inc:	2 DS DD 5 1/4" floppy or optional 10 mb hard drive
Screen Format:	80x25 or 132x25
Graphics:	32 graphics characters, 256 user definable
Sound:	Yes
Colour:	Optional
Keyboard:	Integrated
Software Included:	Microplan, Spellbinder, acc pak
Software Available:	Extensive
Primary Market:	Business or personal
Manufacturer:	Associate
Available From:	Datacalc Technology Ind Corp.
Suggested Retail:	$4495.00
Other:	114 function keys



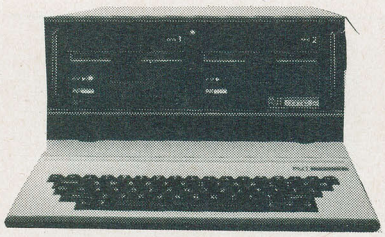
Atari 600XL

Operating System:	BASIC
Processor(s):	6502
RAM:	16K
Printer I/O:	Parallel
Disk Drives Inc.:	Optional disk drive or recorder
Screen Format:	40x24
Graphics:	320x192
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Over 1000 programs
Primary Market:	Home
Manufacturer:	Atari
Available From:	Irwin Electronics
Suggested Retail:	$349.00
Other:	CP/M optional



Atari 800XL

Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc.:	Optional
Screen Format:	40x24
Graphics:	280x192
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	Atari
Available From:	Irwin Electronics
Suggested Retail:	$549.00
Other:	CP/M optional



AVT Comp 2

Operating System:	BASIC and CP/M
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc.:	One 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable; 8 function keys
Software Included:	BASIC
Software Available:	Fortran, PASCAL, etc.
Primary Market:	Personal or business
Manufacturer:	AVT, Switzerland
Available From:	Bee Microsystems
Suggested Retail:	$1695.00 including monitor
Other:	Apple compatible



GRiD Compass

Operating System:	GRiD-OS
Processor(s):	8086 and 8087
RAM:	256K RAM, 384K bubble memory
Printer I/O:	IEEE, two serial; 1200/300 baud modem included
Disk Drives Inc:	Optional floppy or hard disks
Screen Format:	Up to 80x24
Graphics:	320x240 pixels
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	GRiDPlan/Write/Print/Plot/File
Software Available:	Extensive
Weight:	10 lbs.
Primary Market:	Business
Manufacturer:	GRiD Systems Corporation
Suggested Retail:	$8500.00

BEE PC

Operating System:	CP/M-86 and MS-DOS
Processor(s):	8088 and Z80
RAM:	128K
Printer I/O:	One parallel and two serial
Disk Drives Inc:	One 5 1/4" DS DD floppy
Screen Format:	40/80x24 pixels
Graphics:	640x320
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Bee Microsystems
Available From:	Local dealers
Suggested Retail:	$2995.00
Other:	10 programmable function keys



B.E.S.T.

Operating System:	MS-DOS or CP/M-86 optional
Processor(s):	8088
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One DD DS floppy
Screen Format:	80x24
Graphics:	640x325 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	N/A
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Multiflex
Available From:	Exceltronix
Suggested Retail:	$1995.00
Other:	IBM PC compatible

The Big Blue Board

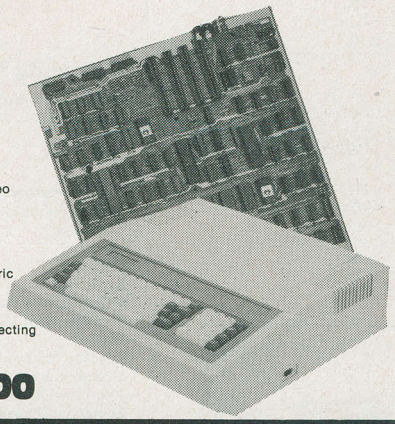
Operating System:	MS-DOS or CP/M-86
Processor(s):	8088 (optional 8087)
RAM:	128K; expandable to 256K
Printer I/O:	Optional card
Disk Drives Inc:	One slimline 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x200
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	DOS BIOS in EPROM
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Robin Hood Electronics
Available From:	Robin Hood Electronics
Suggested Retail:	$2495.00
Other:	IBM compatible

ORION ELECTRONICS . . . . . COMPUTER ROOM . . . . . ORION ELECTRONICS . . . . . COMPUTER ROOM

WINNER: Ultra-modern! Super-efficient! Fully Apple Compatible

Please note the distinct features Winner offers:

- *Dual microprocessors 6502 & Z-80A
- *RS-232 built in
- *Disk drive interface card built in
- *40/80 column text display and auto change video output port by soft switch
- *76K RAM with 4 expansion slots
- *16K ROM
- *DOS 3.2 & DOS 3.3 capability
- *Apple & CP/M compatible
- *ASCII keyboard with function keys and a numeric keypad
- *Upper/lower case
- *Streamline case
- *OS could be changed when desired without affecting other memory RAM



$995.00

APPLE COMPATIBLE COMPUTERS

48K Color Computer with standard keyboard	$498.95
48K Color Computer with numeric keys & function keys	$549.95
64K Color Computer with standard keyboard	$549.95
64K Color Computer with numeric and function keys	$598.95
64K Color Computer (Dual-6502 & Z80A, CP/M), Numeric & function keys	$649.95

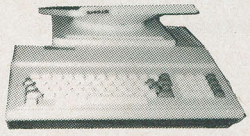
"ADD VISION TO YOUR COMPUTER WITH THE MICRON EYE" - solid state - programs included - hardware, software & optics included, $380.00

Smith-Corona Correct III Messenger & Typewriter *

● Portable typewriter ● Optional serial or parallel interface for letter quality printer! ● One touch memory ● 3 different type sizes ● 10 different styles ● With Interface $950.00



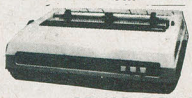
$750.00



Universal Monitor Swivell

$39.00

TTX™ 1014



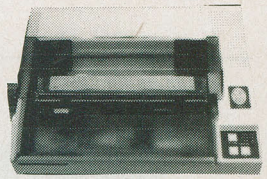
$749.00

RELIABLE DAISY WHEEL RO PRINTER

1014 FEATURES

- SERIAL AND PARALLEL INTERFACE
- WORDSTAR* COMPATIBLE
- QUIET OPERATION
- PROGRAMMABLE PITCH AND LINE SPACING
- COMPACT AND DURABLE
- MICRO, MINI, MAINFRAME COMPATIBLE
- INTEGRAL PIN FEED GUIDE (ADJUSTABLE)
- RIBBON CARTRIDGES AND PRINTWHEELS READILY AVAILABLE.

CP80 DOT MATRIX PRINTER



7x8 DOT MATRIX BIDIRECTIONAL

80 CPS, 640 DOTS/LINE PER SECOND

80 COLUMN NORMAL 14L COMPRESSED FRICTION & TRACTOR FEED

STANDARD CENTRONICS PARALLEL

SAME AS EPSON 80

$495.00

6502 BOARDS & ACCESSORIES



$395.00

Roland CB-141 Color B

Composite system color display

- Composite system, 14-inch colour display.
- With its built-in amplifier and speaker, it accommodates games, video monitor, etc.
- Low cost, but provides high performance with sound circuit & headphone jack.
- Protected from an erroneous operation of a floppy disk drive unit and dealt with a shield treatment for a magnetic interruption against other electronic units.

RGB Electrohome Monitors from $349.00

ABB-1 $ 59.00 APPLE II Compatible, Motherboard (no components)

6502 Board Kit $275 Includes all parts, less ROMS

PDA-232C $ 99.00 Serial interface RS232C Card for APPLE II c/w Cable & Manual, Three Operating Modes: I/O, Terminal, Remote

AEB-1 $ 99 00 EPROM Burner Card

AIC-1 $ 89.00 Integer Card

AEC-1 $ 89.00 80 Column Card

AZC-1 $ 79.00 Z80A (CPM) Card

APC-1 $ 89.00 Parallel Printer Card

ASC-1 $ 89.00 Serial Printer Card

ALC-1 $69.00 16K RAM (Language) Card

AKB-2 $109.95 Keyboard; Numeric Keypad with Function Keys, replacement for APPLE II.

AC-2 $99.00 Beige APPLE II Case (for above Keyboard)

Case & Keyboard Numeric $175.00

APS-2 $99.00 Switching Power Supply for APPLE II; + 5V @ 5 amps, + 12V @3 amps, -5V @ ½ amp, -12V @ ½ amp; c/w on-off switch & connecting wires

AAA-2 Disc Drive, 5¼", APPLE II Compatible, Excluding Controller Card $299.00

With Controller $365.00

ADC-1 $89.00 Disc Drive Controller Card for two drives; Apple II Compatible

APPLE II is a registered trade mark of Apple Computer Inc.

ORION

Electronic Supplies Inc.
40 Lancaster Street West
Kitchener, Ontario N2H 4S9
(519) 576-9902

Timex Sinclair 1000

Assembled $45.00

ZX81 Printer $109.00



16K Sinclair Memory $45.00

Books

COMPLETE ZX81 BASIC COURSE - inc. 2 tapes	39.95
NOT ONLY 30 PROGRAMS: 1K	16.95
MACHINE LANGUAGE MADE SIMPLE	19.95
ZX81 ROM DISASSEMBLY PART A & PART B	24.95
UNDERSTANDING ZX81 ROM	19.95
T/S 1000: PROGRAMS, GAMES and GRAPHICS	16.95
LEARNING T/S BASIC	23.95
THE BASIC HANDBOOK	29.95
49 EXPLODING GAMES	16.95
COMPUTER FOR KITS SINCLAIR EDITION	8.95
MASTERING MACHINE CODE ON YOUR ZX81	24.95
T/S 1000 USERS GUIDE (Vol 1)	16.95
EXPLORERS GUIDE TO THE ZX81	16.95
ZX81 POCKET BOOK	16.95
GETAWAY GUIDE	16.95
GETTING AQUAINTED WITH YOUR ZX81	16.95

Hardware

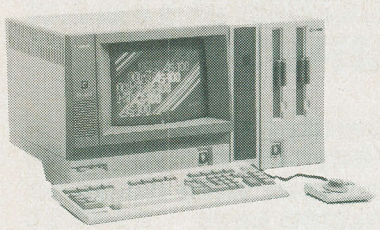
ZX81 Ass.	45.00
Sinclair Printer	109.00
Timex Printer	125.00
ZX Print	119.00
64K RAM (Memotech)	199.00
ORION 64K	149.00
32K RAM (Memotech)	119.00
16K RAM (Sinclair)	45.00
500MA	9.95
Power Supply (650 M.A.)	14.95
Power Supply (1 AMP)	19.95
Keyboard (uncased) - 47 Keys, Assembled no soldering req.	119.95
Metal Case for above	29.95
Memopak Centronics Type Parallel Printer Interface	119.00
Memopak ZX81 Keyboard	129.00
Memo Calc	79.95

* Interface for any serial printer & 4 cassette recorders; includes plugs, cords and a detailed manual.

Additional Hardware & Software for the SINCLAIR ZX81 AVAILABLE ON REQUEST.

ORION ELECTRONICS . . . . . COMPUTER ROOM . . . . . ORION ELECTRONICS . . . . . COMPUTER ROOM

Circle No. 4 on Reader Service Card.



Canon AS-100

Operating System:	CP/M or DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" or 8" floppy or 5" hard
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	2 BASICs
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Canon
Available From:	Office Equipment
Suggested Retail:	$3525.00
Other:	Available with colour ink jet printer



Chameleon I

Operating System:	CP/M and DOS
Processor(s):	Z80A and 8088
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One DS 5 1/4" floppy
Screen Format:	80x24
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Perfect Writer/Calc, MS-DOS, MBASIC, GWBASIC, C Term
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Seequa
Available From:	York Computers
Suggested Retail:	$2995.00
Other:	9" monitor

Chameleon II

Operating System:	CP/M and DOS
Processor(s):	Z80A and 8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two DS DD 5 1/4" floppy
Screen Format:	80x24
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Perfect Writer/Calc/Speller, MS-DOS, MBASIC, GWBASIC, C Term, Condor I
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Seequa
Available From:	York Computers
Suggested Retail:	$3995.00
Other:	9" monitor

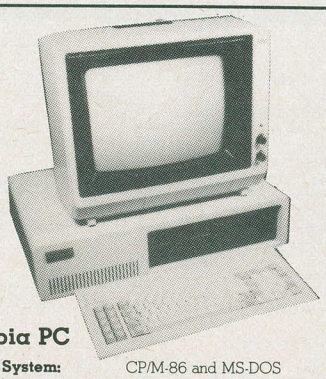
Chameleon XT

Operating System:	CP/M and DOS
Processor(s):	Z80A and 8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One DS 5 1/4" floppy, one 10 mb hard drive
Screen Format:	80x24
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Perfect Writer/Calc/Speller, MS-DOS, MBASIC, GWBASIC, C Term, Condor I
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Seequa
Available From:	York Computers
Suggested Retail:	$5500.00
Other:	9" monitor



Coleco Adam

Operating System:	SmartBASIC
Processor(s):	Z80A
RAM:	80K
Printer I/O:	Serial plus 4 ports
Disk Drives Inc.:	Digital cassette (50 ips.)
Screen Format:	36x25
Graphics:	High res
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	SmartWriter, SmartBASIC, game
Software Available:	Lots; Atari and Apple BASIC compatible
Primary Market:	Home or business
Manufacturer:	Coleco
Available From:	Gladstone Electronics
Suggested Retail:	$999.00
Other:	Letter quality printer included



Columbia PC

Operating System:	CP/M-86 and MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	Dual 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	320/640x200
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Two operating systems, Perfect software
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Columbia Data Systems
Available From:	Hamax Data Systems
Suggested Retail:	
Other:	IBM compatible, optional 10 mb hard disk



Columbia VP

Operating System:	CP/M 86, MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial, parallel and seven exp. slots
Disk Drives Inc.:	Two half-height 5 1/4" DS DD
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Perfect series, Fast Graphics
Software Available:	Extensive; IBM compatible
Weight:	32 lbs.
Primary Market:	Business
Manufacturer:	Columbia Data Systems
Available From:	Peripherals Plus
Suggested Retail:	$4495.00
Other:	



Commodore 64

Operating System:	BASIC
Processor(s):	6510
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc.:	Optional 5 1/4' drive
Screen Format:	40x25
Graphics:	320x200
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	Commodore
Available From:	Local retailers
Suggested Retail	$429.95
Other:	



Commodore 4032

Operating System:	BASIC
Processors:	6502
RAM:	32K
Printer I/O:	IEEE, parallel
Disk Drives Inc:	Optional
Screen Format:	40x24
Graphics:	128 graphics characters in ROM
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Education
Manufacturer:	Commodore Business Machines
Available From:	Local dealers
Suggested Retail:	$1095.00
Other:	Integrated monitor

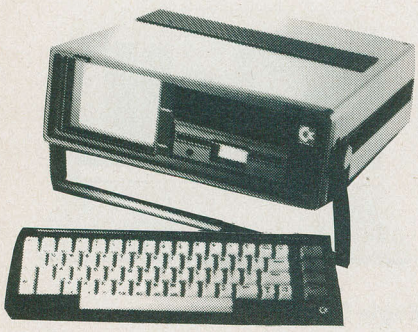


Commodore 8032

Operating System:	BASIC
Processor(s):	6502
RAM:	32K
Printer I/O:	Parallel and IEEE
Disk Drives Inc.:	Optional
Screen Format:	80x25
Graphics:	128 characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Educational software
Primary Market:	Educational
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1395.00

Commodore 8096

Operating System:	BASIC
Processors:	6502 and 6809
RAM:	96K
Printer I/O:	Serial and IEEE
Disk Drives Inc:	Optional
Screen Format:	80x25
Graphics:	128 graphic characters in ROM
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1695.00



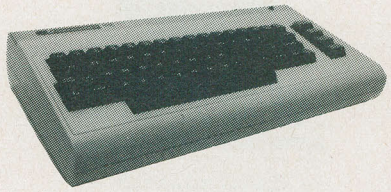
Commodore Executive 64

Operating System:	PET BASIC
Processor(s):	6510
RAM:	64K
Printer I/O:	Serial and IEEE
Disk Drives Inc.:	One 5 1/4" drive
Screen Format:	40x25
Graphics:	320x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Software Available:	Compatible with C-64
Weight:	27.6 lbs.
Primary Market:	Business
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1499.00



Commodore SuperPET

Operating System:	microBASIC
Processor(s):	6502 & 6809
RAM:	96K
Printer I/O:	Serial and IEEE
Disk Drives Inc.:	Optional
Screen Format:	80x25
Graphics:	128 characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	Waterloo APL/BASIC/COBOL/FORTRAN/PASCAL
Software Available:	Extensive
Primary Market:	Education
Manufacturer:	Commodore
Available From:	Local dealers
Suggested Retail:	$1795.00
Other:	Integrated monitor



Commodore VIC 20

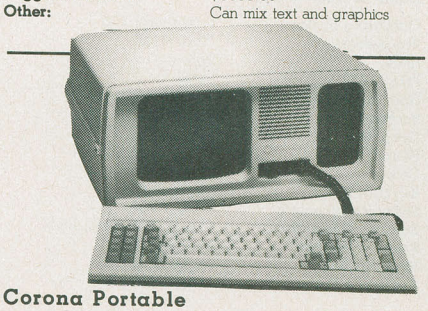
Operating System:	BASIC
Processor(s):	6502
RAM:	5K
Printer I/O:	Serial
Disk Drives Inc.:	Optional 1541 SSSD floppy
Screen Format:	22x23
Graphics:	178x184
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	Commodore
Available From:	Local retailers
Suggested Retail:	$219.95 with datasette

Copam PC-301

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	One parallel, two serial
Disk Drives Inc:	Two floppy
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS, CP/M-86
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Copam Canada
Available From:	Universal Computer Systems
Suggested Retail:	$3495.00
Other:	IBM compatible

Corona PC

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One SS DD floppy
Screen Format:	80x24
Graphics:	640x325
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Multimate, two tutorials
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Corona
Available From:	Scarsdale Computers
Suggested Retail:	$3888.00
Other:	Can mix text and graphics



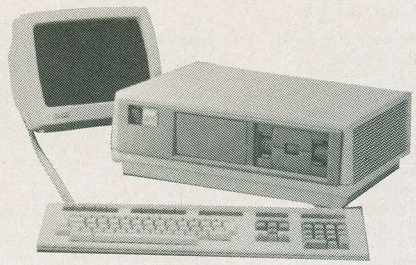
Corona Portable

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial and parallel; four exp. slots
Disk Drives Inc.:	One half-height drive
Screen Format:	80x24
Graphics:	640x325 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	PC Tutor, GW BASIC, Multimate
Software Available:	Lots; IBM compatible
Weight:	28 lbs.
Primary Market:	Business
Manufacturer:	Corona
Available From:	Scarsdale
Suggested Retail:	$3888.00



Cromemco C-10SP

Operating System:	CP/M COMP
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two DS DD floppy drives
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	BASIC, word processor, spreadsheet
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Cromemco
Available From:	NSN Options
Suggested Retail:	$2995.00



DEC Decmate II

Operating System:	Proprietary DOS
Processor(s):	12 bit 6120
RAM:	96K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80/132x24
Graphics:	N/A
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	DOS, WPS8
Software Available:	Extensive; supports CP/M
Primary Market:	Business
Manufacturer:	Digital Equipment
Available From:	Local Dealers

DEC Rainbow 100

Operating System:	CP/M-86 or MS-DOS
Processor(s):	Z80 and 8088
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80/132x24
Graphics:	Optional: 900X260
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	Choice of CP/M-86 or MS-DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Digital Equipment
Available From:	Local Dealers
Suggested Retail:	$4600.00



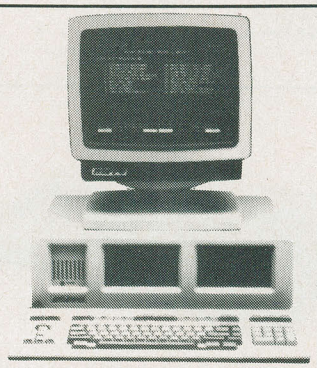
Dimension 68000

Operating System:	CP/M-68K
Processor(s):	68000L8
RAM:	128K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	Two 5 1/4" DS DD floppy
Screen Format:	20x20 to 100x50
Graphics:	160x500 pixels to 640x500 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC, CP/M-68K, C, 68000 assembler
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Micro Craft Corporation
Available From:	Popular Electronic Products
Suggested Retail:	$5995.00
Other:	Can emulate Apple][, IBM PC, Kaypro, Osborne and others with optional hardware.



DOT Portable

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial
Disk Drives Inc.:	Two 3 1/2" SS DD
Screen Format:	80x25
Graphics:	1056x254 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	MS-DOS
Software Available:	Lots; IBM compatible
Weight:	31 lbs.
Primary Market:	Business
Manufacturer:	Computer Devices
Available From:	Datamex
Suggested Retail:	N/A
Other:	Integrated printer

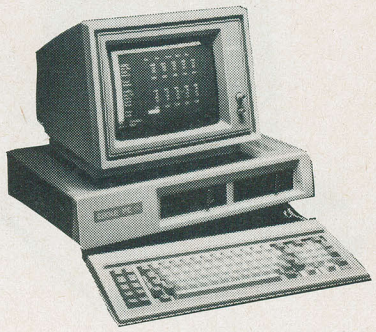


Durango Poppy II

Operating System:	XENIX
Processor(s):	80186 and 80286
RAM:	384K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	One 800K floppy, one 10 mb drive (optional 20 mb hard drive)
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	N/A
Keyboard:	Detachable
Software Included:	XENIX
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Durango Systems Inc.
Available From:	Norango Computer Systems Inc.
Suggested Retail:	$16000.00
Other:	14" monitor and station

Durango Poppy

Operating System:	MS-DOS
Processor(s):	80186
RAM:	128K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	One 800K floppy
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	N/A
Keyboard:	Detachable
Software Included:	MS-DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Durango Systems Inc.
Available From:	Norango Computer Systems Inc.
Suggested Retail:	$6995.00
Other:	14" monitor and station included

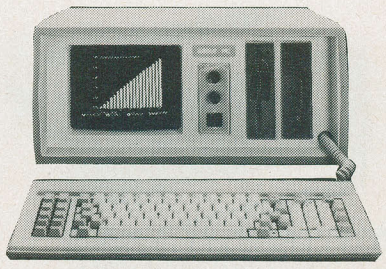


Eagle Plus

Operating System:	MS-DOS, CP/M-86, GWBASIC
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	One or two 5 1/4" floppy
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Operating systems, EagleWriter, EagleCalc
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Eagle Computers
Available From:	DataTech Systems Ltd.
Suggested Retail:	$3530.00 with one floppy, $4100.00 with two

Eagle Plus XL

Same as the Eagle Plus, but with 10 megabytes of integrated hard storage. $6250.00



Eagle Spirit

Operating System:	MS-DOS, CP/M-86, GWBASIC
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	One or two 5 1/4" floppy
Screen Format:	40/80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Operating systems, EagleWriter, EagleCalc
Software Available:	Extensive
Weight:	33 lbs.
Primary Market:	Business
Manufacturer:	Eagle Computers
Available From:	DataTech Systems Ltd.
Suggested Retail:	$4820.00
Other:	Integrated 9" monitor

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Bay #26, 1410 - 40 Ave. N.E.
Calgary
(403)250-2898

Data Terminal Mart
#170 301 - 14th St. N.W., Calgary
(403)270-3737

CCD Computer Systems
12302A Jasper Ave., Edmonton
(403)482-7187

Computique
10056 - 101A Ave., Edmonton
(403)424-9061

Cridome Systems Ltd.
12120 - 106 Ave., Edmonton
(403)488-8250

Data Terminal Mart
10357 - 109 St., Edmonton
(403)420-1755

Petch Software Ltd.
182 Sifton Ave., Fort McMurray
(403)791-6937

Westlock Computers Ltd.
P.O. Box 846, Westlock
(403)349-5776

Manitoba

National Typewriter Co. Ltd.
272 Main Street, Winnipeg
(204)942-2141

New Brunswick

Interactive Computer Systems
554 Queen St., Fredericton
(506)454-7691

Newfoundland

Interactive Computer Systems
827 Main St., Moncton
(506)389-3333

Interactive Computer Systems
28 King Street, St. John

Micro-Tech Computer Centre
P.O. Box 5174, St. Johns
(709)722-0782

Nova Scotia

Future World Computers Inc.
142 Aberdeen St., Kentville
(902)678-0101

Data Terminal Mart
800 Windmill Rd., Dartmouth
(902)469-3782

Ontario

Valley Computer Systems
44 Elgin St., West, Arnprior
(613)623-7628

Executive Computers
14 Green Pine Ave. (R.R. #3),
Barrie (Midhurst)
(705)722-3373

Altair Electronics Ltd.
221 Front St., Belleville
(613)962-0980

Computer Forum Inc.
332 Main Street N., Brampton
(416)453-1100

Altair Electonics Ltd.
5 Court House Ave., Brockville
(613)342-0885

Microcomm
43 King St., Ste 201, Brockville
(613)342-9263

MicroMan Consultants Inc.
3455 Fairview St., Burlington
(416)632-3704

New Wave Computers
7 Montreal Rd., Cornwall
(613)937-0043

Altair Electronics Enterprises
660 Progress Ave, Kingston
(613)384-3876

Kingston Business Systems
33 Earl Street, Kingston
(613)549-6163

Nielsen Computers Inc.
275 Lancaster St., W., Kitchener
(519)743-1830

Innotech Computers Inc.
240 Wharncliffe Rd., N., London
Suite 305
(519)433-3177

Alpha Bytes Computers Corp.
104 - 7321 Victoria Park Road,
Markham
(416)475-3249

Computer Junction
570 Hood Street, Markham
(416)475-1188

Multipost Retail Systems
241 - 7305 Woodbine Ave.,
Markham
(416)281-8849

Computer Junction
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(416)624-1500

Spacefile Ltd.
1145 Fewster Dr., Mississauga
(416)625-2096

Compu-Lease Systems Inc.
1568 Merivale Road, Nepean
(613)226-8933

F-Stop Camera Shop Ltd.
150 First Street, Orangeville
(519)941-4381

CON-PUTE, Div. of Conaby's Ltd.
333 King St. W., Oshawa
(416)475-3249

Automated Micro Systems
130 Slater St., #210, Ottawa
(613)230-6020

Computer Worlds (Saunix)
1335 Carling Avenue, Ottawa
(613)725-0500

ComputerWorks Distributing
430 Bank Street, Ottawa
(613)230-7364

Data Terminal Mart
1335 Carling Avenue, Ottawa
(613)729-5196

Resomax Management Inc. (R.M.I.)
124 O'Connor St., #306, Ottawa
(613)995-4811

Computer Images
56 James Street, Parry Sound
(705)746-8813

MicroMan Consulting
161 King Street, Peterborough
(705)748-5129

Comsec Marketing Ltd.
44 Frasken Dr., Unit 1D, Rexdale
(416)675-3753

Micro Bazzar
23 Westmore Dr. Unit 5, Rexdale
(416)745-4740

Elm Computer Systems Inc.
4 - 1646 Victoria Park, Scarborough
(416)751-8711

Mr. Software (Tregor Systems)
Woodside Sq., 1571 Sandhurst
Circle, Scarborough
(416)291-3404

International Phototypesetter Exchange
Box 185, Sharon
(416)473-3626

Remtek
1 Industrial Rd., Shelburne
(519)925-6254

Rainbow Computer Systems
67 Queen Street, St. Catherines
(416)682-4335

Databay Ltd.
2826 Arthur Street E., Thunder Bay
(807)-623-1955

Computer Centre
490 Yonge Street, Toronto
(416)966-5151

Computer Projections
406 Ontario Street, Toronto

Data Terminal Mart
655 Dixon Rd., Toronto
(416)245-4780

Data Terminal Mart
120 Adelaide Street W., Toronto
(416)364-4480

Micro Center
85 Richmond Street W., Toronto
(416)366-3236

Agri Computers Inc.
495 Dotzert Court, Waterloo
(519)885-4300

Compulife Software Inc.
500 - 22 King Street, S., Waterloo
(519)746-1880

DBS Data Management Ltd.
575 Kumpf Drive, Waterloo
(519)885-3105

Compucollege Stores
5631 Yonge Street, Willowdale
(416)226-6654

Compugen
218 Yorkland Bld., Willowdale
(416)494-2979

On Line Computer Centre
5318 Yonge Street, Willowdale
(416)226-3333

SysteMan
3495 Pineview Rd., P.O. Box 3322,
Windsor
(519)735-4078

Quebec

Micro Basic Systems
7720 Henri Bourassa, Charlesbourg
(418)628-8080

Data Terminal Mart
3575 Ave. du Parc, Ste 4306,
Montreal
(514)288-1555

Lawson Business Forms Quebec
5740 Ferrier, Montreal
(514)731-3851

M.I.P Inc.
1460 Mackay, Montreal
(514)934-1297

Maison Bit Inc.
5172 Queen Mary Rd., Montreal
(514)489-3825

St. Laurent Micro Computers
824 Decarie, St. Laurent
(514)744-4956

Saskatchewan

Interactive Systems Inc.
1102 8th Avenue, Regina
(306)522-3828

Data Terminal Mart
315 - 25th St., E., Saskatoon
(306)665-7222

Datatec Computer Systems
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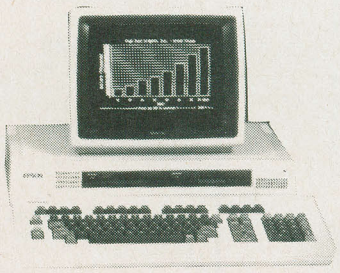
Eagle Spirit XL

Same as the Eagle Spirit, but includes integrated 10 megabyte hard drive. $6965.00



Epson HX 20

Operating System:	BASIC
Processor(s):	6301
RAM:	16K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Micro cassette
Screen Format:	20x4 LCD
Graphics:	120x32 pixels
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	SkiWriter
Software Available:	
Weight:	1.73 kg.
Primary Market:	Business
Manufacturer:	Epson
Available From:	Epson Canada
Suggested Retail:	$1099.00
Other:	Notebook style; built-in printer



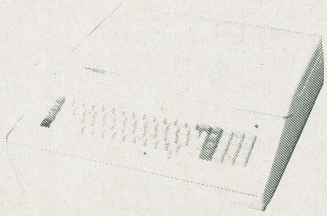
Epson QX-10

Operating System:	Valdocs
Processor(s):	Z80A
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two DS DD 5 1/4" floppy
Screen Format:	80x25
Graphics:	640x400
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Indexer, word processor, mail system, more
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Epson
Available From:	Epson Canada
Suggested Retail:	$4295.00



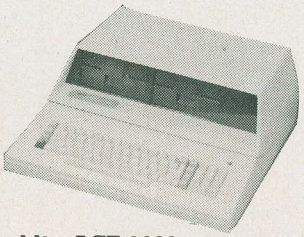
Expander

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	5 1/4" or 8" floppy
Screen Format:	80x24
Graphics:	80x72 with colour
Sound:	Yes
Colour:	Yes; 256 colours standard
Keyboard:	Integrated
Software Included:	CP/M
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	California Computer Systems
Available From:	Orion Electronic Supplies
Suggested Retail:	$1295.00
Other:	



Franklin ACE 1000

Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc.:	Optional
Screen Format:	40x24
Graphics:	280x192
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Lots; Apple compatible
Primary Market:	Business
Manufacturer:	Franklin Computer Corp.
Available From:	Franklin ACE Canada
Suggested Retail:	$1495.00



Franklin ACE 1200

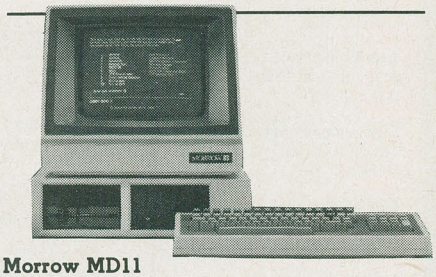
Operating System:	CP/M or BASIC
Processor(s):	6502, Z80A
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	SS floppy
Screen Format:	40/80x24
Graphics:	280x192
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Franklin Computer Corp.
Available From:	Franklin ACE Canada
Suggested Retail:	$2895.00

Fujicomp PC 1000

Operating System:	BASIC
Processor(s):	6502
RAM:	48K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	N/A
Available From:	Fujicomp
Suggested Retail:	$650.00
Other:	Programmable keys

Fujicomp PC 5500

Operating System:	BASIC
Processor(s):	6502 and Z80
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional slimline 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable; 188 function keys
Software Included:	BASIC
Software Available:	Extensive; Apple compatible
Primary Market:	Business or home
Manufacturer:	N/A
Available From:	Fujicomp
Suggested Retail:	$850.00
Other:	Ten user defined keys; five year memory



Morrow MD11

Operating System:	CP/M 3.0
Processor(s):	Z80A
RAM:	128K
Printer I/O:	One parallel, three serial
Disk Drives Inc:	One 5 1/4" floppy, one 11 megabyte hard
Screen Format:	80x25
Graphics:	N/A
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Newword, Correct-it, Personal Pearl Database, SuperCalc 2, Quest, MBASIC, PILOT
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Morrow
Available From:	Micro Bazzar
Suggested Retail:	$4295.00

Heath H-100

Operating System:	Choice
Processor(s):	8088 and 8085
RAM:	192K
Printer I/O:	2 serial and 1 parallel
Disk Drives Inc:	1 DS DD 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x225 pixels
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	CP/M or ZDOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Heathkit
Available From:	Heathkit
Suggested Retail:	$3300.00; $3500.00 with integrated monitor
Other:	Kit version of Zenith Z-100

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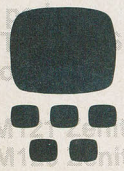
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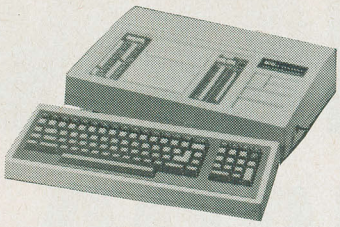
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Heath ET-100

Operating System:	Assembler, editor and debugger
Processor(s):	8088
RAM:	16K
Printer I/O:	One serial, one programmable parallel
Disk Drives Inc:	Cassette based; disk upgrade available
Screen Format:	40x20 or 80x24
Graphics:	33 graphic characters
Sound:	Yes
Colour:	Optional upgrade
Keyboard:	Detachable
Software Included:	CP/M assembler, editor and debugger
Software Available:	Extensive with upgrade
Primary Market:	Hobbyist and education
Manufacturer:	Heathkit
Available From:	Heathkit
Suggested Retail:	$2000.00
Other:	Available in kit or assembled form



Hewlett-Packard 75C

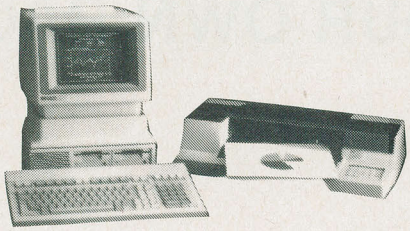
Operating System:	BASIC
Processor(s):	CMOS
RAM:	16K
Printer I/O:	H-P IL
Disk Drives Inc.:	Optional cassette
Screen Format:	32 character window
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Touch type
Software Included:	BASIC
Software Available:	Applications software
Weight:	737.1 grams
Primary Market:	Business
Manufacturer:	Hewlett-Packard
Available From:	Hewlett-Packard
Suggested Retail:	$1687.00
Other:	Battery operated

HiTECH

Operating System:	BASIC and CP/M
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Two SS SD 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business or home
Manufacturer:	HiTECH
Available From:	HiTECH Computer Systems
Suggested Retail:	$1995.00
Other:	Apple and Apple CP/M compatible

HP Series 200 Model 16

Operating System:	Optional
Processor(s):	68000
RAM:	128K
Printer I/O:	Serial and IEEE
Disk Drives Inc:	N/A
Screen Format:	80x25
Graphics:	300x400 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Choice of BASIC, HPL or Pascal
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Hewlett Packard
Available From:	NSN Options
Suggested Retail:	$8495.00



HP 150 Touchscreen

Operating System:	MS-DOS, HP Touch
Processor(s):	8088
RAM:	256K
Printer I/O:	Two serial, one IEEE-488
Disk Drives Inc:	Optional floppy or hard drives
Screen Format:	80x24
Graphics:	512x390 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	MS-DOS, P.A.M.
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Hewlett Packard
Available From:	NSN Options
Suggested Retail:	$4859.00



Hyperion

Operating System:	MS-DOS
Processor(s):	8088
RAM:	256K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Two 5 1/4" DS DD
Screen Format:	80x25
Graphics:	640x250
Sound:	Programmable
Colour:	No
Keyboard:	Detachable
Software Included:	In:Scribe, Multiplan
Software Available:	Lots; IBM compatible
Weight:	9.6 kg.
Primary Market:	Business
Manufacturer:	Bytec-Comterm
Available From:	Computerland
Suggested Retail:	$4950.00



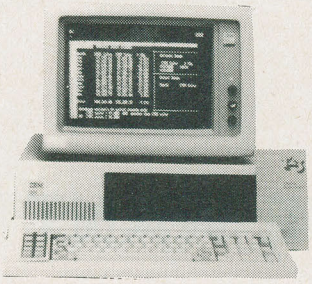
IBM PC

Operating System:	PC DOS, UCSD p-System and CP/M-86
Processor(s):	8088
RAM:	64K
Printer I/O:	Expansion slots
Disk Drives Inc:	One 160K drive
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Operating systems
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	International Business Machines
Available From:	Local dealers
Suggested Retail:	$4800.00
Other:	Optional auxiliary storage with expansion unit



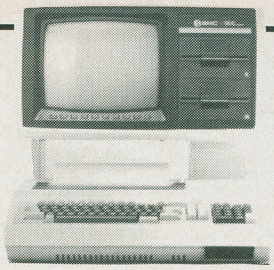
IBM PCjr

Operating System:	DOS 2.1 (enhanced model), Cassette BASIC
Processor(s):	8088
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc:	Optional DS 5 1/4" floppy
Screen Format:	40x24
Graphics:	N/A
Sound:	Yes
Colour:	Yes
Keyboard:	Detached; infra red link
Software Included:	BASIC; DOS 2.1 (with enhanced model)
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	International Business Machines
Available From:	Local Dealers
Suggested Retail:	$1900.00
Other:	Compatible with 30 IBM PC programs



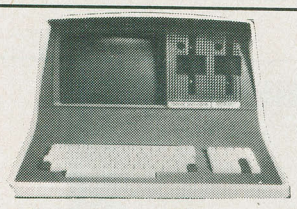
IBM XT

Operating System:	PC-DOS, UCSD p-System, CP/M-86
Processor(s):	8088
RAM:	128K
Printer I/O:	Expansion slots
Disk Drives Inc:	One 5 1/4" floppy, one 10 mb hard drive
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	Operating systems
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	International Business Machines
Available From:	Local Dealers
Suggested Retail:	$8500.00



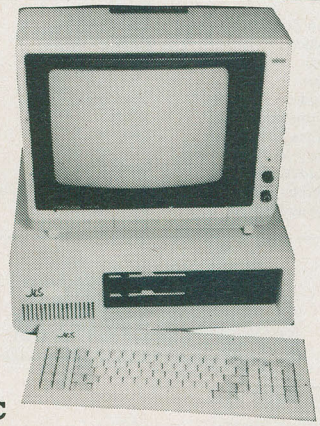
IF 800

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	CP/M and BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	OKI Data, Japan
Available From:	Canada Computer
Suggested Retail:	$4995.00 with colour monitor
Other:	Other configurations available



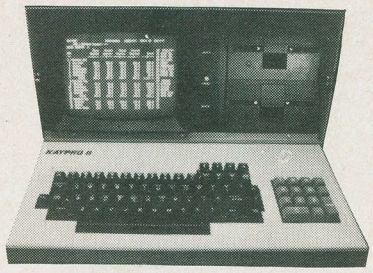
Intertec Superbrain II Jr

Operating System:	DOS and CP/M
Processor(s):	Twin Z80As
RAM:	64K
Printer I/O:	2 serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	CP/M, DOS, BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Intertec Data Systems
Available From:	E.M.J. Data Systems
Suggested Retail:	$4365.00



JLS PC

Operating System:	Optional; MS-DOS, CP/M-86
Processor(s):	8088
RAM:	64K
Printer I/O:	One serial and one parallel
Disk Drives Inc:	One 320K 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x320 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Software Available:	Extensive; IBM compatible
Primary Market:	Business
Manufacturer:	JLS Computers
Available From:	JLS Computers
Suggested Retail:	$2800.00

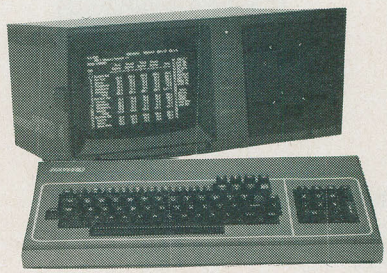


Kaypro II

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial and parallel
Disk Drives Inc.:	Two 5 1/4" SS DD
Screen Format:	80x24
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Perfect Writer, Profit Plan
Software Available:	Extensive
Weight:	26 lbs.
Primary Market:	Business
Manufacturer:	Kaypro
Available From:	Computron
Suggested Retail:	$2795.00

Kaypro II Plus 88

Operating System:	CP/M, MS-DOS
Processor(s):	Z80A, 8088
RAM:	320K
Printer I/O:	
Disk Drives Inc.:	
Screen Format:	80x24
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Same as II
Software Available:	Extensive; IBM compatible
Weight:	27 lbs.
Primary Market:	Business
Manufacturer:	Kaypro
Available From:	Computron
Suggested Retail:	$2995.00



Kaypro 4

Same as Kaypro II, but featuring DS DD disk drives and Uniform software.

Kaypro 4 Plus 88

Same as Kaypro II Plus 88, but featuring more data storage capacity.

Kaypro 10

Same as Kaypro 4, but uses one floppy disk drive and a hard drive, and offers 160x100 pixel graphics.



Base 64

Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive; Apple and CP/M compatible
Primary Market:	Business and home
Manufacturer:	Copam
Available From:	Micro Computech
Suggested Retail:	$749.00



The President

Operating System:	Optional; MS-DOS or CP/M-86
Processor(s):	8088
RAM:	128K
Printer I/O:	One serial
Disk Drives Inc:	Two slimline 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	640x320 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Software Available:	Extensive; IBM compatible
Primary Market:	Business or home
Manufacturer:	President Computer Corp.
Available From:	President Computer Corp.
Suggested Retail:	$2895.00
Other:	High resolution monochrome monitor included

Micro 48

Operating System:	BASIC
Processor(s):	6502
RAM:	48K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business or home
Manufacturer:	N/A
Available From:	Gladstone Electronics
Suggested Retail:	$499.95
Other:	Apple compatible



Micro Professor

Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	One parallel
Disk Drives Inc.:	Optional
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Apple compatible
Weight:	N/A
Primary Market:	Business
Manufacturer:	Multitech Ind. Corp.
Available From:	Polytech
Suggested Retail:	$600.00

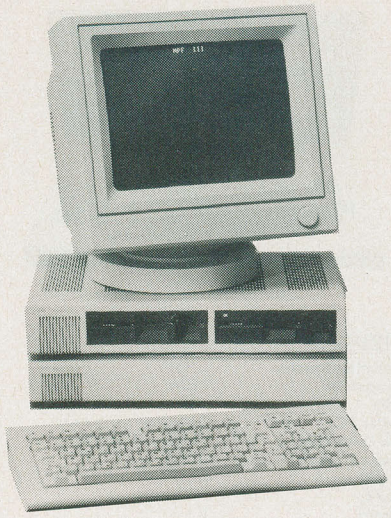
Morrow MD3P

Operating System:	CP/M 2.2, Microsoft BASIC
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	Two 5 1/4" DS DD floppy drives
Screen Format:	80x24
Graphics:	60 graphics characters
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	New Word, Correct It, Logicalc, Personal Pearl data base
Software Available:	Extensive
Weight:	24 lbs.
Primary Market:	Business
Manufacturer:	Morrow
Available From:	Computerized Business Systems
Suggested Retail:	$2849.00



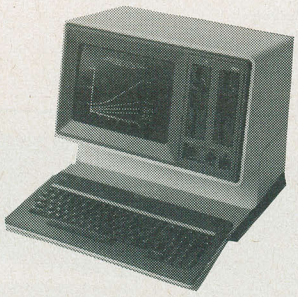
Morrow Micro Decision MD3

Operating System:	CP/M 2.2
Processor(s):	Z80
RAM:	64K
Printer I/O:	Two serial
Disk Drives Inc:	720K floppy disk
Screen Format:	80x24
Graphics:	N/A
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Word processor, speller, spreadsheet, more
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Morrow
Available From:	Micro Bazzar
Suggested Retail:	$2895.00
Other:	Three programming languages included



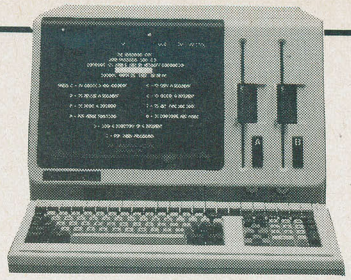
MPF III

Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes; 36 tone sound chip
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Software Available:	Extensive; Apple compatible
Primary Market:	Business or home
Manufacturer:	Multitech
Available From:	Micro Computech
Suggested Retail:	$1300.00
Other:	Price includes green phosphor monitor



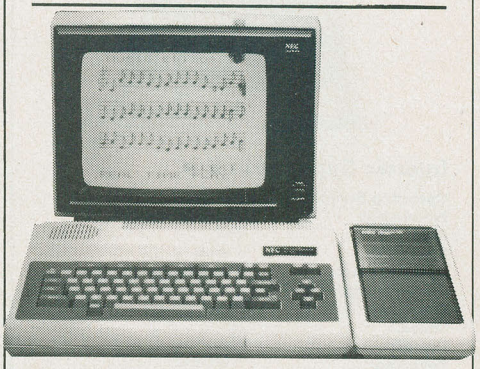
NCR PC Computer

Operating System:	CP/M
Processor(s):	Z80
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two floppy or one floppy, one hard
Screen Format:	80x24
Graphics:	640x400
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	BASIC, financial and word processor
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	NCR
Available From:	SGV Marketing
Suggested Retail:	$3895.00 (0102); $6895.00 (0103); $4495.00 (1102); $7250.00 (1103)
Other:	0103 model has a hard disk, 1102 model has Z80 and 8088 processors, 1103 model has both processors and a hard drive. Other models available.



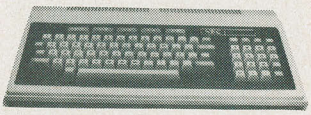
NEC Advanced Personal Computer

Operating System:	CP/M, MS-DOS
Processor(s):	8086
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One or two 8" floppy
Screen Format:	80x25
Graphics:	640x475 pixels display window
Sound:	Yes
Colour:	Optional
Keyboard:	Detached
Software Included:	CP/M and MS-DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	NEC
Available From:	Microcomputers of Canada, Inc.
Suggested Retail:	$4195.00 1 drive; $5195.00 2 drives
Other:	$6395.00 with colour



NEC PC-6000

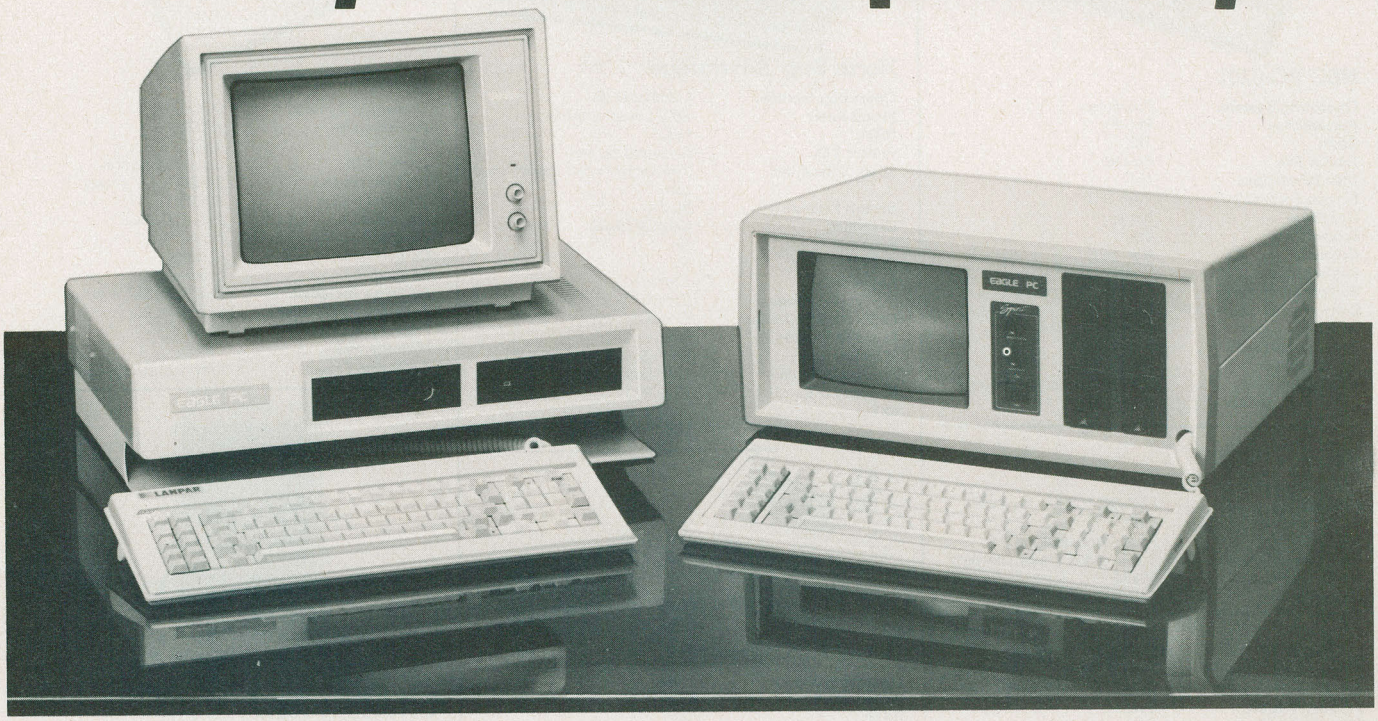
Operating System:	BASIC
Processor(s):	PD780C-1; Z80 compatible
RAM:	16K
Printer I/O:	Parallel
Disk Drives Inc:	Optional disk drive or tape recorder
Screen Format:	32x16
Graphics:	356x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	NEC
Available From:	Microcomputers of Canada Inc.
Suggested Retail:	$499.95



NEC 8001 A

Operating System:	BASIC
Processor(s):	PD780C-1
RAM:	32K
Printer I/O:	Parallel and serial
Disk Drives Inc:	Cassette or optional disk I/O unit
Screen Format:	80x25
Graphics:	160x100 pixels
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	NEC
Available From:	Microcomputers of Canada Inc.
Suggested Retail:	$1495.00
Other:	Processor is Z80 compatible

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Single Floppy & 10M byte Hard Disk		•		•
128K RAM Memory	•	•	•	•
Memory Expansion To 640K	•	•	•	•
16-bit 8088* CPU	•	•	•	•
MS-DOS, CP/M-86, GW BASIC Included	•	•	•	•
9-inch built-in monitor	•	•		
Optional 12-inch monitor	•	•	•	•
Optional 14-inch colour monitor	•	•	•	•
Optional EagleNet Networking	•	•	•	•
IBM PC Compatible	•	•	•	•
IBM PC XT Compatible		•		•
Two Serial Ports	•	•	•	•
One Parallel Port	•	•	•	•
Four IBM Compatible Expansion Slots	•	•	•	•

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NEC PC-8201

Operating System:	Proprietary
Processor(s):	80C85
RAM:	16K
Printer I/O:	Parallel
Disk Drives Inc.:	No
Screen Format:	40x8 LCD
Graphics:	Block
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	Textfiles, Telecom
Software Available:	Limited
Weight:	4.0 lbs.
Primary Market:	Business
Manufacturer:	NEC
Available From:	Microcomputers of Canada
Suggested Retail:	$1195.00

NEC PC 8801

Operating System:	BASIC
Processor(s):	PD780C-1; Z80 compatible
RAM:	64K
Printer I/O:	Parallel and serial
Disk Drives Inc:	5 1/4" and 8" floppy interfaces
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	Two BASICs
Software Available:	Extensive; CP/M compatible
Primary Market:	Business
Manufacturer:	NEC
Available From:	SGV Marketing
Suggested Retail:	$1795.00



Nelma Persona

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	2 serial and 1 parallel
Disk Drives Inc:	2 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	WordStar, CalcStar, comm. software
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Nelma Data Corporation
Available From:	Selected ComputerLand outlets, local dealers
Suggested Retail:	$2995.00
Other:	$3995.00 with ten megabyte hard drive with 128K RAM and CP/M Plus



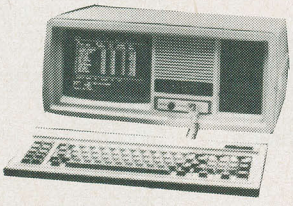
North Star Advantage

Operating System:	CP/M or DOS
Processor(s):	Z80A; optional 8088
RAM:	64K
Printer I/O:	Serial and parallel
$Disk Drives Inc:	Two floppy or one floppy, one hard
Screen Format:	80x24
Graphics:	640x240 pixels
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	CP/M or DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	North Star
Available From:	TRW Data Systems
Suggested Retail:	$3999.00
Other:	Systems with hard drives start at $6850.00



North Star Horizon

Operating System:	Choice
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial, one parallel, S100
Disk Drives Inc:	Two floppy or one floppy, one hard
Screen Format:	N/A
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	N/A
Software Included:	CP/M or DOS, or Multi-user TSS, TSS/C
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	North Star
Available From:	TRW Data Systems
Suggested Retail:	$4750.00
Other:	Systems with hard drives start at $6850.00



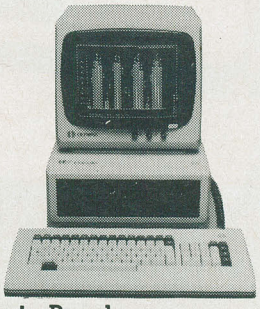
Olivetti M-18

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc.:	One half-height 5 1/4" DS DD
Screen Format:	80x25
Graphics:	640x325 pixels
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	
Software Available:	Extensive; IBM compatible
Weight:	28 lbs.
Primary Market:	Business
Manufacturer:	Corona
Available From:	Computerized Business Systems
Suggested Retail:	$4495.00
Other:	Shock mounted disk drives



Olivetti M20

Operating System:	PCOS
Processor(s):	Z8001
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	DS DD 5 1/4" floppy
Screen Format:	80x25
Graphics:	512x256 pixels
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	PCOS, BASIC, tutorials
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Olivetti
Available From:	Provincial Business Systems



Olympia People

Operating System:	CP/M and MS-DOS
Processor(s):	8086
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two floppy drives
Screen Format:	80x25
Graphics:	600x485 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	WordStar, SuperCalc, dBASE II
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	Olympia International
Available From:	Olympia Business Machines Canada Limited
Suggested Retail:	$5450.00



Orion 0412

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial/ 2 expansion ports
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional card; 1024x678 pixels B&W
Sound:	No
Colour:	Optional card; 640x480 pixels colour
Keyboard:	Detachable
Software Included:	CP/M
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	DY-4 Systems, Inc.
Available From:	Prelco Electronics
Suggested Retail:	$3244.00
Other:	Multi-user capabilities

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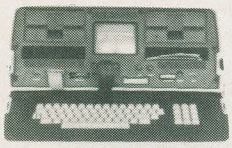
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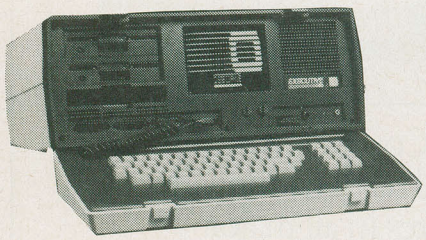
Orion III

Operating System: BASIC and CP/M
Processor(s): 6502 and Z80A
RAM: 64K
Printer I/O: Optional serial or parallel
Disk Drives Inc: Optional 5 1/4" floppy
Screen Format: 40x24
Graphics: 280x192 pixels
Sound: Yes
Colour: Yes
Keyboard: Integrated; programmable function keys
Software Included: BASIC
Software Available: Extensive
Primary Market: Business and home
Manufacturer: N/A
Available From: Orion Electronics Supplies Inc.
Suggested Retail: $595.00
Other: Apple compatible



Osborne 1

Operating System: CP/M
Processor(s): Z80A
RAM: 64K
Printer I/O: Serial and parallel
Disk Drives Inc: Two 5 1/4" floppy
Screen Format: 52x24
Graphics: Graphic characters in ROM
Sound: No
Colour: No
Keyboard: Detachable
Software Included: WordStar, MailMerge, SuperCalc, more
Software Available: Extensive
Primary Market: Business
Manufacturer: Osborne Canada
Available From: Lanpar
Suggested Retail: $1995.00



Osborne Executive

Operating System: CP/M and UCSD p-System
Processor(s): Z80A
RAM: 128K
Printer I/O: Two serial
Disk Drives Inc.: Two 5 1/4" SS SD drives
Screen Format: 80x24
Graphics: No
Sound: No
Colour: No
Keyboard: Integrated
Software Included: WordStar, MailMerge, SuperCalc, Personal Pearl
Software Available: Extensive
Weight: 23 1/2 lbs.
Primary Market: Business
Manufacturer: Osborne Canada
Available From: Lanpar
Suggested Retail: $3495.00



Panama XT

Operating System: Optional; MS-DOS or CP/M-86
Processor(s): 8088
RAM: 64K
Printer I/O: One serial, one parallel
Disk Drives Inc: One half-height 5 1/4" floppy; optional hard drive
Screen Format: 40/80x24
Graphics: 640x320 pixels
Sound: Yes
Colour: Optional
Keyboard: Detached
Software Included: BIOS in ROM
Software Available: Extensive
Primary Market: Business
Manufacturer: Ogivar Inc.
Available From: Ogivar Inc., local dealers
Suggested Retail: $3000.00
Other: Keyboard also has French characters

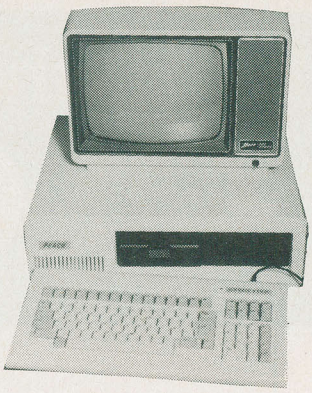


Panasonic HHC

Operating System: SNAP
Processor(s): 6502
RAM: 8K
Printer I/O: Peripheral Connector
Disk Drives Inc.: 8 or 16K RAM modules
Screen Format: 26 character LCD
Graphics: 159x8
Sound: No
Colour: No
Keyboard: QWERTY
Software Included:
Software Available: Panasonic software
Weight: 620 grams
Primary Market: Business
Manufacturer: Panasonic
Available From: Panasonic
Suggested Retail: $549.00
Other: Built-in rechargeable batteries

Peach IV

Operating System: BASIC
Processor(s): 6502 and Z80A
RAM: 128K
Printer I/O: Optional serial or parallel
Disk Drives Inc: Optional 5 1/4" floppy
Screen Format: 40/80x24
Graphics: 280x192
Sound: Yes
Colour: Yes
Keyboard: Integrated
Software Included: BASIC
Software Available: Extensive
Primary Market: Business or home
Manufacturer: Peach Microsystems
Available From: Technical House
Suggested Retail: $1099.00
Other: Disk controller on board



Peach Executive

Operating System: BASIC
Processor(s): 6502 and Z80A
RAM: 128K
Printer I/O: Optional serial or parallel
Disk Drives Inc:
Screen Format: 40/80x24
Graphics: 280x192
Sound: Yes
Colour: Yes
Keyboard: Detachable
Software Included: BASIC
Software Available: Extensive
Primary Market: Business
Manufacturer: Peach Microsystems
Available From: Technical House
Suggested Retail: $1399.00



Pied Piper

Operating System: CP/M
Processor(s): Z80A
RAM: 64K
Printer I/O: Parallel
Disk Drives Inc.: One 5 1/4" floppy
Screen Format: 80x24
Graphics: 10 graphics characters
Sound: No
Colour: No
Keyboard: Integrated
Software Included: Perfect Writer/Speller/Filer/Calc
Software Available: Extensive
Weight: 12.5 lbs.
Primary Market: Home or business
Manufacturer: Semi-Tech Microelectronics
Available From: Semi-Tech Microelectronics
Suggested Retail: $1799.00

Pied Piper Professional

Operating System: CP/M
Processor(s): Z80A
RAM: 64K
Printer I/O: One serial, one parallel
Disk Drives Inc: Two 5 1/4" floppy
Screen Format: 80x24
Graphics: 10 graphics characters
Sound: No
Colour: No
Keyboard: Integrated
Software Included: CBASIC, Perfect software, terminal package
Software Available: Extensive
Primary Market: Business
Manufacturer: Semi-Tech Microelectronics
Available From: STM, Gladstone and local dealers
Suggested Retail: $2775.00
Other: Monitor stand included

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List $235

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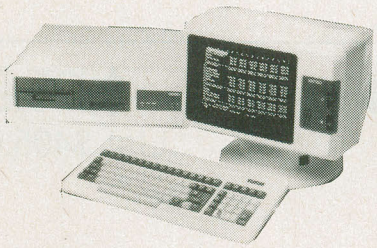
BOX 365, POSTAL STN. "L", WINNIPEG, MANITOBA R3H 0Z6

Circle No. 24 on Reader Service Card.



Sanyo 4000/4050

Operating System:	CP/M-86
Processor(s):	8086 and 8048 (keyboard)
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	One 5 1/4" DDDD floppy (4000) or two (4050)
Screen Format:	80x25
Graphics:	No
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M-86 and BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$4595.00 (4000 model)



Seiko 8600

Operating System:	CP/M-86 and MS-DOS, others available
Processor(s):	8086
RAM:	128K
Printer I/O:	Four serial and one parallel
Disk Drives Inc:	Two 5 1/4" floppy; optional hard drive
Screen Format:	80x25
Graphics:	64 graphic characters
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	Choice
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Seiko
Available From:	Canada Computers



Sharp PC 1500

Operating System:	BASIC
Processor(s):	C—MOS
RAM:	2.6K
Printer I/O:	Optional printer/cassette interface
Disk Drives Inc:	Optional printer/cassette interface
Screen Format:	26x1 LCD
Graphics:	7x156 pixels
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Limited
Primary Market:	Home or business
Manufacturer:	Sharp
Available From:	Total Office Systems
Suggested Retail:	$299.95
Other:	Battery operated



Sharp PC 5000

Operating System:	MS-DOS
Processor(s):	8088 and C-MOS
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc.:	Opt. 128K bubble cartridge
Screen Format:	80x8 LCD
Graphics:	640x80 pixels
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	N/A
Software Available:	Extensive; IBM compatible
Weight:	5 kg.
Primary Market:	Business
Manufacturer:	Sharp Electronics
Available From:	Total Office Systems
Suggested Retail:	$2695.00



Sharp YX 3200

Operating System:	CP/M and FDOS
Processor(s):	YX3200
RAM:	64K
Printer I/O:	Parallel and serial
Disk Drives Inc:	Optional 5 1/4" or 8" floppy
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	Two BASICs
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	Sharp
Available From:	Total Office Systems
Suggested Retail:	$2800.00



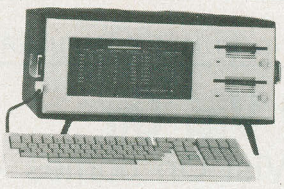
Sinclair ZX-81

Operating System:	BASIC
Processor(s):	Z80
RAM:	1K
Printer I/O:	Expansion port for ZX-Printer
Disk Drives Inc:	Cassette based
Screen Format:	32x16
Graphics:	32 graphic characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	Sinclair
Available From:	Gladstone Electronics
Suggested Retail:	$29.95
Other:	Original version of T/S 1000



SKS Model 2000

Operating System:	CP/M 2.2
Processor(s):	Z80A
RAM:	80K
Printer I/O:	Two serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	CP/M, Perfect software and SKSMENU
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	SKS Computers
Available From:	Canada Computers
Other:	Programmable keys, many options available
Suggested Retail:	$3695.00; $4695.00 (16 bit model)



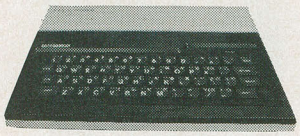
SKS Nano

Operating System:	CP/M, MS-DOS
Processor(s):	Z80A or 80186
RAM:	80K
Printer I/O:	Serial or parallel
Disk Drives Inc.:	One 5 1/4" floppy drive
Screen Format:	80x24
Graphics:	Yes
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	Perfect Writer/Speller/Calc/Filer
Software Available:	Extensive
Weight:	27 lbs.
Primary Market:	Business
Manufacturer:	SKS
Available From:	Canada Computer
Suggested Retail:	$2995.00



Sony SMC-70

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial, parallel, 5 expansion ports
Disk Drives Inc:	Optional SS DD 3 1/2" floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	CP/M
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Sony
Available From:	Total Office Systems
Suggested Retail:	$2100.00



Sord M5

Operating System:	BASIC
Processor(s):	Z80A
RAM:	20K
Printer I/O:	Parallel
Disk Drives Inc:	Optional cassette
Screen Format:	40x24 (TV)
Graphics:	N/A
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Available from Sord
Primary Market:	Home
Manufacturer:	Sord
Available From:	Micos Computer Systems Inc.
Other:	Sprite graphics



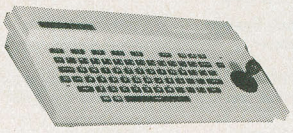
Sord M23P

Operating System:	CP/M compatible
Processor(s):	Z80A, PIPS
RAM:	128K
Printer I/O:	Two S, P, and three expansion slots
Disk Drives Inc.:	Two 3 1/2" floppy drives
Screen Format:	80x8 LCD
Graphics:	640x64
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	Spreadsheet
Software Available:	Extensive
Weight:	9 kg.
Primary Market:	Business
Manufacturer:	Sord
Available From:	Micos Computer Systems Inc.
Suggested Retail:	$2995.00



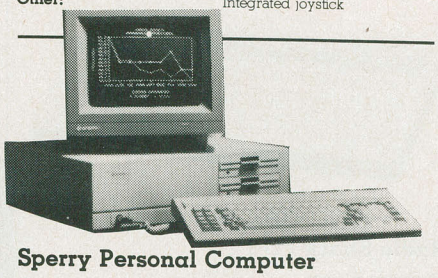
Sord M68

Operating System:	
Processor(s):	MC68000, Z80A
RAM:	256K
Printer I/O:	2 serial, parallel, IEEE bus
Disk Drives Inc:	2 5" mini floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	N/A
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Sord
Available From:	Micos Computer Systems, Inc.



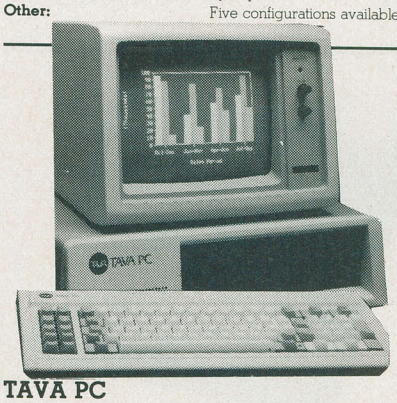
Spectravideo SV 318

Operating System:	BASIC
Processor(s):	Z80A
RAM:	32K
Printer I/O:	Expansion bus
Disk Drives Inc:	Optional floppy or cassette
Screen Format:	40x24
Graphics:	256x192; 32 sprites
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	Spectravideo
Available From:	Spectravideo
Other:	Integrated joystick



Sperry Personal Computer

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc:	One or two 5 1/4" floppy or 10 mb hard
Screen Format:	40/80x25
Graphics:	320x200, 320x400, 640x200 or 640x400 pixels
Sound:	No
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS
Software Available:	Popular business software
Primary Market:	Business
Manufacturer:	Sperry Inc.
Available From:	Sperry Inc.
Other:	Five configurations available



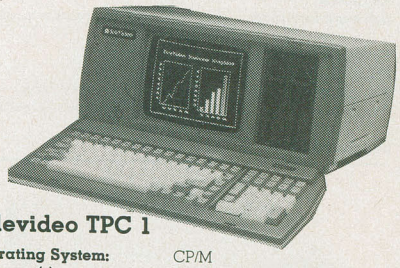
TAVA PC

Operating System:	CP/M-86, MS-DOS, UCSD p-System
Processor(s):	8088
RAM:	64K
Printer I/O:	Two serial, one parallel
Disk Drives Inc:	
Screen Format:	40/80x25
Graphics:	640x320 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	Operating systems
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	TAVA Corporation
Available From:	Nielsen Computers Inc.
Other:	Includes IBM 3270 emulator
Suggested Retail:	$3395.00



Telcon Zorba

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	IEEE, parallel and serial
Disk Drives Inc.:	Two 5 1/4" DS DD drives
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	WordStar, MailMerge, CalcStar
Software Available:	Extensive
Weight:	22 lbs.
Primary Market:	Business
Manufacturer:	Telecon Ind. Inc.
Available From:	Micro Bazzar
Suggested Retail:	$2995.00
Other:	Full and half intensity monitor



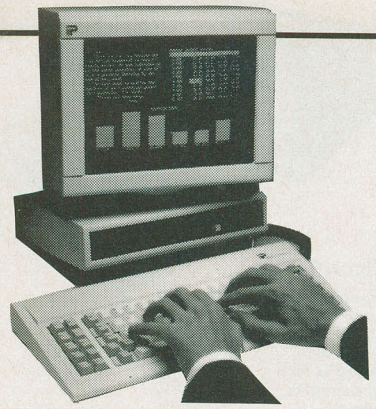
Televideo TPC 1

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc.:	One 5 1/4" floppy drive
Screen Format:	80x24
Graphics:	640x240 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	GSX-80 Graphics, word processing, spreadsheet
Software Available:	Extensive
Weight:	25 lbs.
Primary Market:	Business
Manufacturer:	Televideo
Available From:	Datamex
Suggested Retail:	$3200.00 (2 drives)



Televideo TS 803

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x240 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Televideo
Available From:	Datamex
Suggested Retail:	$3704.00
Other:	TS 803H (One floppy, one 10 megabyte hard) $5936.00



Pronto 16/10

Operating System:	MS-DOS
Processor(s):	80186
RAM:	128K
Printer I/O:	2 serial, 1 parallel, 4 expansion ports
Disk Drives Inc:	2 5 1/4" floppy
Screen Format:	80x25
Graphics:	Optional 640x480 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	BASIC, word processor, spreadsheet, more
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Pronto Computers, USA
Available From:	Progeni Computer Consultants Limited
Suggested Retail:	$5900.00



QCAL 600

Operating System:	BASIC
Processor(s):	6502
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Cassette interface; optional 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	QCAL International
Available From:	Pacific Rim Electronic Imports
Suggested Retail:	$669.00
Other:	Apple compatible

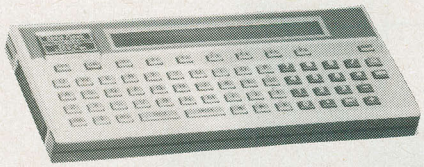


QCAL 980

Operating System:	BASIC or CP/M
Processor(s):	6502 and Z80
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive; CP/M and Apple compatible
Primary Market:	Business or home
Manufacturer:	QCAL International
Available From:	Pacific Rim Electronic Imports
Suggested Retail:	$839.00
Other:	94 function keys

QCAL 1000

Operating System:	BASIC or CP/M
Processor(s):	6502 and Z80
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional dual 5 1/4" slimline floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC
Software Available:	Extensive; CP/M and Apple compatible
Primary Market:	Business or home
Manufacturer:	QCAL International
Available From:	Pacific Rim Electronic Imports
Suggested Retail:	$849.00
Other:	188 function keys; user defined keys



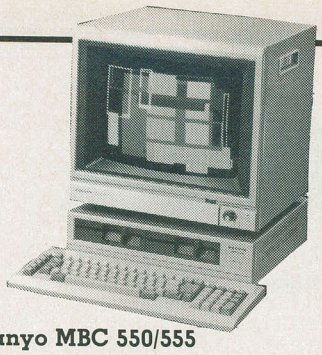
Radio Shack PC-2

Operating System:	BASIC
Processor(s):	Proprietary
RAM:	2.6K
Printer I/O:	Optional printer/plotter/dual cassette interface
Disk Drives Inc:	As above
Screen Format:	LCD
Graphics:	7x156 pixels
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$159.95
Other:	4 or 8K RAM packs available



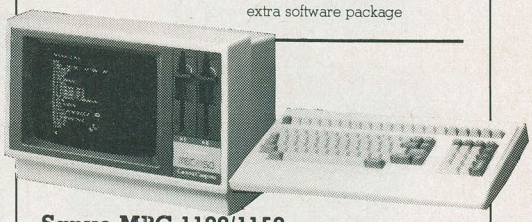
Radio Shack PC-4

Operating System:	BASIC
Processor(s):	Proprietary
RAM:	5K
Printer I/O:	Optional
Disk Drives Inc:	Optional cassette
Screen Format:	12 character LCD
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Limited
Primary Market:	Business or home
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$99.95



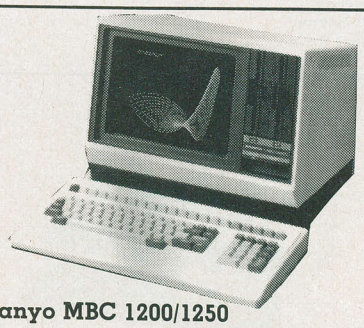
Sanyo MBC 550/555

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Optional serial
Disk Drives Inc:	One 5" floppy (550) or two (550)
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	BASIC, MS-DOS
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$1495.00
Other:	$1995.00 for 550 model with extra software package



Sanyo MBC 1100/1150

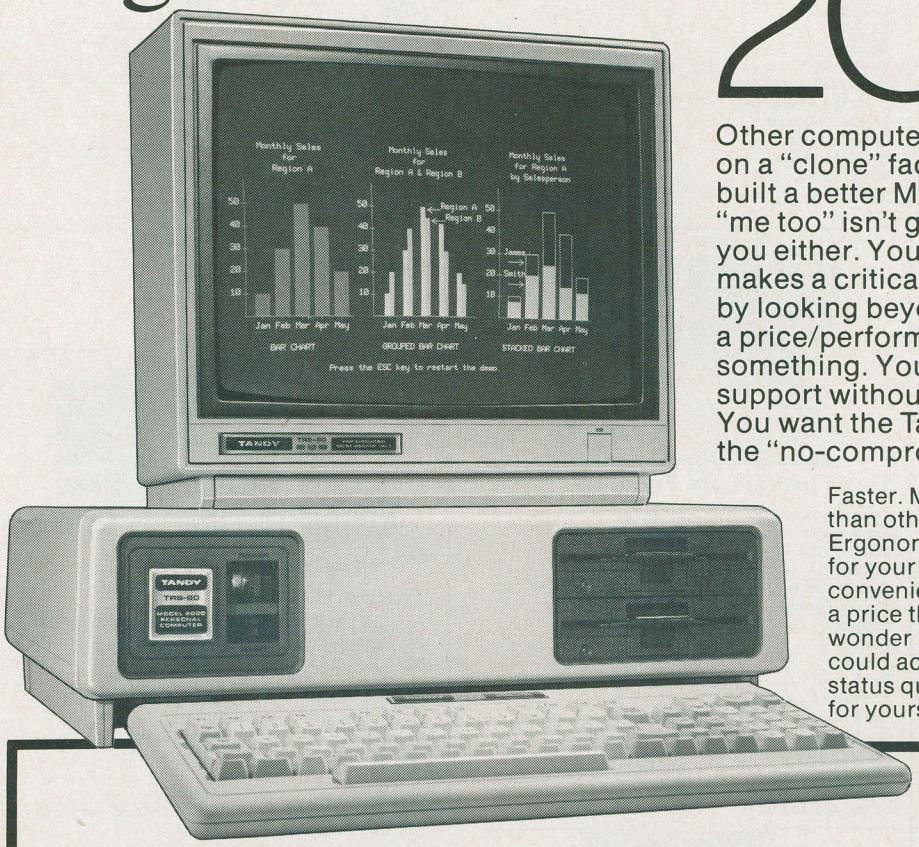
Operating System:	CP/M 2.2
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Parallel and serial
Disk Drives Inc:	One 5 1/4" floppy (1100) or two (1150)
Screen Format:	80x25
Graphics:	N/A
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M 2.2 and BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$2795.00 (1100 model)



Sanyo MBC 1200/1250

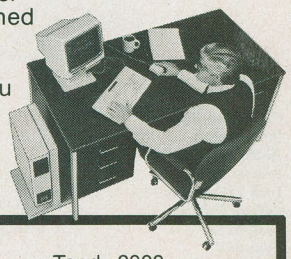
Operating System:	CP/M 2.2
Processor(s):	Two Z80A, one 8048 (keyboard)
RAM:	64K
Printer I/O:	Parallel and serial
Disk Drives Inc:	One DS DD 5 1/4" floppy (1200) or two (1250)
Screen Format:	80x33/40
Graphics:	640x400 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M and BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Sanyo
Available From:	Astris Science Inc.
Suggested Retail:	$3495.00 (1200 model)

If you believe there's something better than status quo, you're right... TANDY 2000



Other computer makers are content to put on a "clone" face. Not Radio Shack. We built a better MS-DOS computer because "me too" isn't good enough for us. Or for you either. You're the kind of person who makes a critical decision about computers by looking beyond the nameplate. You want a price/performance ratio that really means something. You want technical and software support without compromise.
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4150.00 Tandy 2000 with two disk drives

Compare Tandy 2000 .... the computer you would have designed yourself

Price Comparison†	Tandy 2000	IBM Personal Computer
Base Unit	$4150	$3117
2nd Drive	Included (720K)	$799 (320K)
Monochrome Monitor	$349	$507
Display/Printer Adapter	Included	$492
128K RAM	Included	$249
RS-232	Included	$181
MS-DOS 2.0 Operating System	Included	$75
Total Cost*	$4499	$5420

Feature Description	Tandy 2000	IBM Personal Computer
Internal Memory	128K Standard	64K Standard
Disk Capacity Per Drive	720K	320K
Clock Speed	8 MHz	4.7 MHz
True 16-Bit Microprocessor	Yes (80186) 16 bit/16 bit data path	No (8088) 16 bit/8 bit data path
User-Available Expansion Slots*	4	2
Graphics Options		
Color Resolution	640 x 400	320 x 200
Number of Colors	8	4
Monochrome Resolution	640 x 400	640 x 200

*Comparable IBM configuration with monochrome adapter and display, communications adapter, two disk drives and 128K RAM. †Manufacturer's pricing as of December 1, 1983

Consult the white pages for the Radio Shack Computer Centre, store or dealer nearest you.

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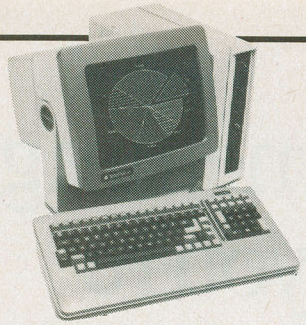
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ADDRESS _____

_____ POSTAL CODE _____

CN/4/84/2000

Circle No. 5 on Reader Service Card.



Televideo TS 1603

Operating System:	CP/M
Processor(s):	8088
RAM:	128K
Printer I/O:	Serial
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M-86 and MMM Ost
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Televideo
Available From:	Datamex
Suggested Retail:	$4420.00
Other:	



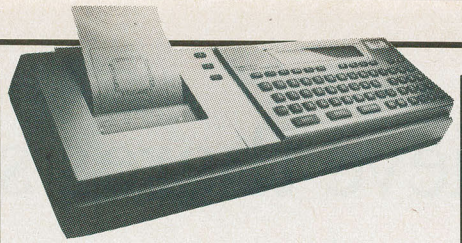
TEO PC.XL

Operating System:	MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial and one parallel
Disk Drives Inc:	Two DS DD 5 1/4" floppy
Screen Format:	40/80x25
Graphics:	320/640x200 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	TEO Computers
Available From:	TEO Computers
Suggested Retail:	$3495.00
Other:	IBM PC compatible



TEO Tiger Personal

Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Two 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	N/A
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	TEO Computers
Available From:	TEO Computers
Suggested Retail:	$1595.00
Other:	Apple compatible



TEO TPC 8300

Operating System:	BASIC
Processor(s):	CMOS
RAM:	6K
Printer I/O:	Parallel
Disk Drives Inc:	Printer/plotter/cassette interface available
Screen Format:	48x2 LCD
Graphics:	255 graphic characters
Sound:	No
Colour:	No
Keyboard:	Integrated
Software Included:	Extended Pocket BASIC
Software Available:	10 free programs included
Primary Market:	Business
Manufacturer:	TEO Computers
Available From:	TEO Computers
Suggested Retail:	$249.00
Other:	Portable; battery or adapter powered



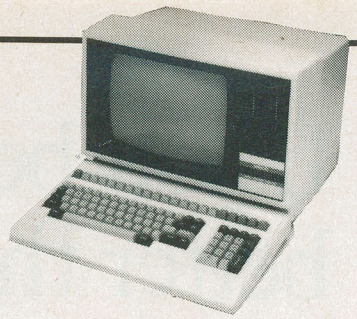
Texas Instruments Portable

Operating System:	MS-DOS
Processor(s):	8088
RAM:	64K minimum
Printer I/O:	Serial and parallel
Disk Drives Inc.:	One half-height 5 1/4" floppy
Screen Format:	80x25
Graphics:	720x300 pixels
Sound:	Yes
Colour:	Optional
Keyboard:	Detachable
Software Included:	
Software Available:	Extensive
Weight:	29 lbs.
Primary Market:	Business
Manufacturer:	Texas Instruments
Available From:	Texas Instruments
Suggested Retail:	Base: $3760.00



TI Professional Computer

Operating System:	Choice of four
Processor(s):	8088
RAM:	64K
Printer I/O:	Serial, 5 expansion ports
Disk Drives Inc:	320K floppy
Screen Format:	80x25
Graphics:	720x300 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	
Software Available:	Supports MS-DOS, CP/M-80, CP/M-86, UCSD
Primary Market:	Business
Manufacturer:	Texas Instruments
Available From:	Lanpar
Suggested Retail:	$4140.00
Other:	Voice management system available



Tomcat PCX 1600

Operating System:	CP/M and MS-DOS
Processor(s):	8086
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two 5 1/4" DS DD floppy
Screen Format:	80x25
Graphics:	Graphics characters in ROM
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M-86 and MS-DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Tomcat
Available From:	Tomcat Computers and local dealers
Suggested Retail:	$3995.00
Other:	IBM compatible



Tomcat PCX 1800

Operating System:	CP/M, CP/M-86, MS-DOS
Processor(s):	Z80A and 8086
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two 5 1/4" DS DD floppy
Screen Format:	80x25
Graphics:	640x400 pixels
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	CP/M, CP/M-86 and MS-DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Tomcat
Available From:	Tomcat Computers and local dealers
Suggested Retail:	$4995.00



Tomcat 3000

Operating System:	MS-DOS, CP/M-80, CP/M-86
Processor(s):	8086 and Z80A
RAM:	128K
Printer I/O:	2 serial
Disk Drives Inc:	8" floppy, 5 1/4" hard
Screen Format:	80x25
Graphics:	640x400
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	MS-DOS, CP/M-80, CP/M-86
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Tomcat
Available From:	Tomcat Computers and local dealers
Suggested Retail:	$16900.00
Other:	26 megabyte storage

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Novation Smart Cat 103/212	779.00
Novation Apple Cat	429.00
Novation Apple Cat 1200 baud upgrade	539.00
Hayes Stack Smartmodem 300	379.00
Hayes Micromodem IIe, with Smartcom I software	429.00
Hayes Stack Smart Modem 1200	799.00
SSM Modemcard 300 Baud	399.00

MONITORS

Zenith ZVM-123	$135.00
Zenith ZVM-122	149.00
Amdek Monochrome 300	225.00
Amdek Amber 300-A	235.00
Amdek Colour I Plus	430.00
Amdek Colour I	399.00

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Wizard 16K Language	$ 99.00
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Wizard BPO Buffered Interface	199.00
Wizard 80 Column	225.00
Wizard Buffered Serial Interface	$249.00
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Unitron Z-80	79.95
Unitron 16K	69.95
Unitron 80 Column	89.95
Wildcard (now compatible with IIe)	145.00
Echo II Speech Synthesizer	199.00
Quadram Microfazer 8K	229.00
Quadram Quadlink	795.00
Quadram Quadboard	375.00
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Transend ASIO Serial Interface	299.00
Microsoft Z-80 softcard (IIe version)	419.00
Microsoft 16K card	129.00
Microsoft Mouse (IBM)	239.00
Microsoft Mouse with Word (IBM)	419.00
Videx Ultraterm	449.00
Cardco "G" Commodore Parallel Interface	119.00
Micropro Wordstar with Applicard	469.00
Micropro Infostar with Applicard	469.00

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Micro Sci A2	299.00
Rana Elite I	360.00
Rana Elite III	949.00
Rana Controller	149.00

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Star Gemini 15X	649.00
Star, STX 80	279.00
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Star Radix 10	$CALL
Star Radix 15	$CALL
Star Ribbons (10X) (15X)	5.99
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Epson MX 100, Ribbon	19.95
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Kraft Paddles	$ 49.95
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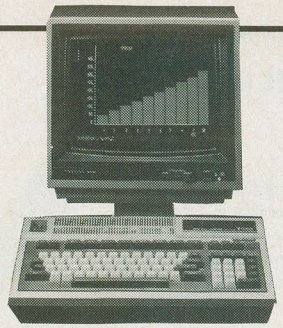
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Toshiba T-100

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Two 5 1/4" DS DD floppy
Screen Format:	80x25
Graphics:	640x200 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	Two BASICs, spreadsheet, word processor and data base
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Toshiba
Available From:	Irwin Electronics
Suggested Retail:	$2995.00



TRS-80 Model 12

Operating System:	TRS-DOS
Processor(s):	Z80
RAM:	80K
Printer I/O:	Two serial and two parallel
Disk Drives Inc:	Two DS DD 8" floppy
Screen Format:	40/80x24
Graphics:	32 business graphics characters
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	TRS-DOS, BASIC
Software Available:	Extensive; TRS-80 Model II compatible
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$5199.00
Other:	Bilingual version $300.00 extra



TRS-80 Color Computer

Operating System:	BASIC
Processor(s):	6809E
RAM:	16K
Printer I/O:	Serial
Disk Drives Inc:	Optional disk drives or cassette
Screen Format:	32x16
Graphics:	256x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$259.00
Other:	$299.00 with Extended BASIC



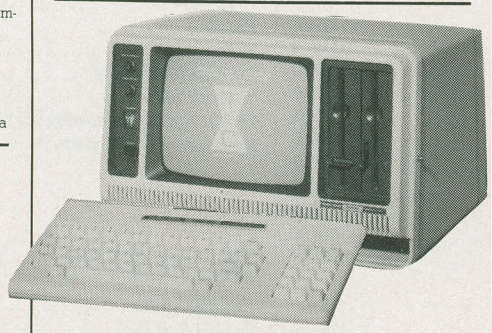
TRS-80 MC 10

Operating System:	BASIC
Processor(s):	6803
RAM:	4K
Printer I/O:	Serial
Disk Drives Inc:	Cassette based
Screen Format:	32x16
Graphics:	Extra block graphics characters
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$59.95
Other:	Expandable to 20K



TRS-80 Model 4

Operating System:	TRSDOS
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Parallel
Disk Drives Inc:	Two SS DD 5 1/4" floppy
Screen Format:	80x24
Graphics:	Optional 640x240 pixels
Sound:	Programmable
Colour:	No
Keyboard:	Integrated
Software Included:	TRSDOS, BASIC
Software Available:	COMP CP/M, LDOS
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$2999.00



TRS-80 Model 4P

Operating System:	Microsoft 5.0, TRSDOS 6.0
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Parallel
Disk Drives Inc.:	Two 5 1/4" floppy drives
Screen Format:	80x24
Graphics:	Optional 640x240 pixel graphics
Sound:	Yes
Colour:	No
Keyboard:	Detachable
Software Included:	
Software Available:	Model III and Model 4 compatible
Weight:	25 lbs.
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$2699.00



TRS-80 Model 100

Operating System:	Extended BASIC
Processor(s):	80C85
RAM:	8K
Printer I/O:	P
Disk Drives Inc.:	No
Screen Format:	40 char. x 8 line LCD
Graphics:	Yes
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	
Software Available:	Limited
Weight:	3.9 lbs.
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$1099.00
Other:	Built-in modem with auto-dialer

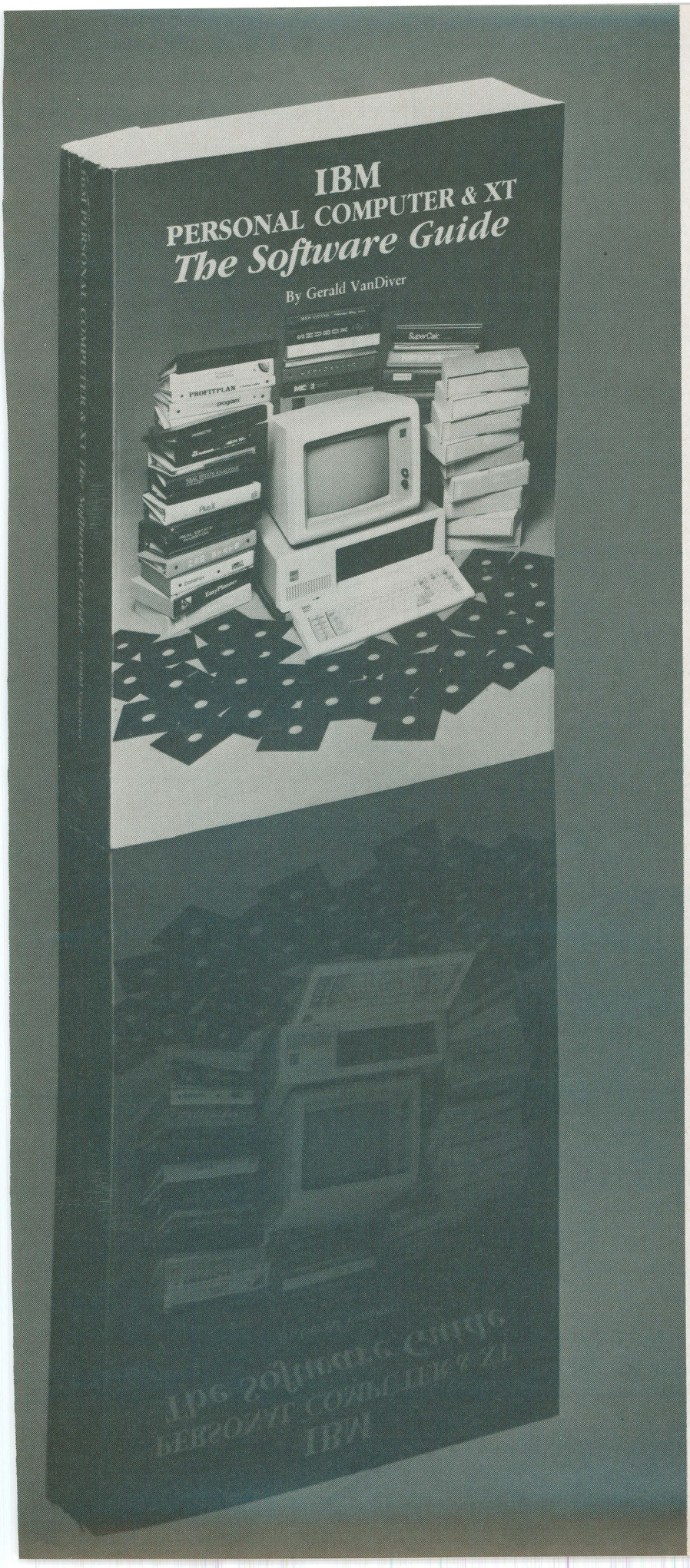


TRS-80 2000

Operating System:	MS-DOS
Processor(s):	80186
RAM:	128K
Printer I/O:	Serial; 4 expansion slots
Disk Drives Inc:	Two slimline 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x400 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Detachable
Software Included:	MS-DOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Tandy
Available From:	Radio Shack
Suggested Retail:	$5899.00 1 drive; $6899.00 2 drives; $9399.00 hard drive
Other:	Processor operates at 8 MHz

Toshiba T-300

Operating System:	MS-DOS
Processor(s):	8088
RAM:	192K; expandable to 512K
Printer I/O:	One serial, one parallel
Disk Drives Inc:	One 5 1/4" DD floppy
Screen Format:	80x25
Graphics:	640x500
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	MS-DOS and TBASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Toshiba
Available From:	Irwin Electronics
Suggested Retail:	$3395.00
Other:	Programmable function keys



IBM PERSONAL COMPUTER & XT: THE SOFTWARE GUIDE

By Gerald VanDiver

This unusually comprehensive guide to the IBM PC software is massive, over 1000 pages — 43mm thick! Not only is it massive, it also is very up-to-date. Software is broken down into 37 major and 150 sub-categories ranging from games to highly sophisticated business and engineering software. This is more than just a listing; not only are specifications given but a very detailed (some of them two pages long) write up. Over 3,000 products are covered in this volume. A real "bible" for the IBM PC user. **$30.95** plus $1.00 shipping.

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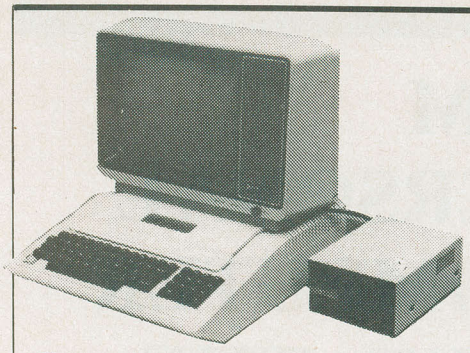
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Unitron

Operating System:	BASIC
Processor(s):	6502
RAM:	48K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	80x25
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Home or business
Manufacturer:	Unitron Computer Corporation
Available From:	Unitron Computer Corporation
Suggested Retail:	$595.00

UR Portabrain

Operating System:	CP/M
Processor(s):	Z80A
RAM:	64K
Printer I/O:	Two serial and parallel
Disk Drives Inc:	5 1/4" floppy, 192K RAM disk
Screen Format:	N/A
Graphics:	N/A
Sound:	N/A
Colour:	N/A
Keyboard:	N/A
Software Included:	CP/M and Communications package
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Universal Research
Available From:	Micro Bazzar
Suggested Retail:	
Other:	Portable



Victor 9000

Operating System:	CP/M and MS-DOS
Processor(s):	8088
RAM:	128K
Printer I/O:	Two serial and two parallel
Disk Drives Inc:	Two 5" SS floppy
Screen Format:	80/132x25
Graphics:	800x400 pixels
Sound:	No
Colour:	Optional
Keyboard:	Detachable
Software Included:	Operating systems, BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Victor
Available From:	Compucollege Stores

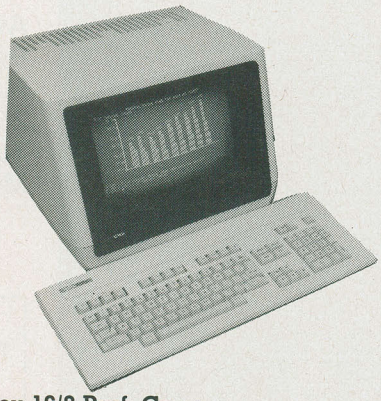


VZ-200

Operating System:	BASIC
Processor(s):	Z80A
RAM:	4K
Printer I/O:	Peripheral expansion bus
Disk Drives Inc:	Cassette based
Screen Format:	32x16
Graphics:	128x64 pixels and 16 graphic keys
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Available from Video Technology Ltd.
Primary Market:	Home
Manufacturer:	Video Technology Ltd.
Available From:	Orion Electronics
Suggested Retail:	$165.00
Other:	On-screen editing

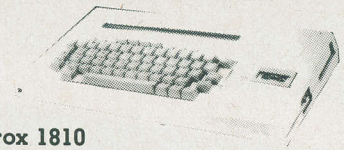
Winner

Operating System:	BASIC
Processor(s):	6502 and Z80A
RAM:	76K
Printer I/O:	Serial
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40/80x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business or home
Manufacturer:	N/A
Available From:	Orion Electronics
Suggested Retail:	
Other:	Function keys; CP/M and Apple compatible



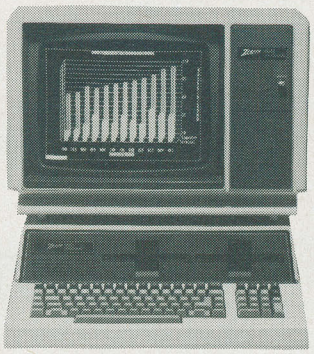
Xerox 16/8 Prof. Comp.

Operating System:	Supports CP/M-80, CP/M-86 and MS-DOS
Processor(s):	8086 and Z80A
RAM:	128K
Printer I/O:	Serial and parallel
Disk Drives Inc:	Optional 2 floppy or 1 hard, 1 floppy
Screen Format:	80x24
Graphics:	Optional
Sound:	No
Colour:	No
Keyboard:	Detachable
Software Included:	BASIC
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Xerox
Available From:	Xerox Stores
Suggested Retail:	$5595.00 SS drives; $6795.00 DS drives
Other:	$8995.00 with rigid disk



Xerox 1810

Operating System:	CP/M
Processor(s):	
RAM:	64K
Printer I/O:	S and P
Disk Drives Inc.:	Cassette built-in
Screen Format:	80x3
Graphics:	Yes
Sound:	Yes
Colour:	No
Keyboard:	Integrated
Software Included:	Text Editor, electronic mail
Software Available:	Limited
Weight:	5 lbs.
Primary Market:	Business
Manufacturer:	Xerox
Available From:	The Xerox Store
Suggested Retail:	$2495.00
Other:	Built-in modem, clock, calendar



Zenith Z-100

Operating System:	Choice
Processor(s):	8088 and 8085
RAM:	128K
Printer I/O:	2 serial and 1 parallel
Disk Drives Inc:	1 DS DD 5 1/4" floppy
Screen Format:	80x24
Graphics:	640x225 pixels
Sound:	No
Colour:	Optional
Keyboard:	Integrated
Software Included:	CP/M or ZDOS
Software Available:	Extensive
Primary Market:	Business
Manufacturer:	Zenith
Available From:	Local dealers
Suggested Retail:	$4395.00 (no monitor); $5295.00 (2 drives)
Other:	$5450.00 with two drives and monitor



Zeus 2001

Operating System:	Variable
Processor(s):	6502
RAM:	64K
Printer I/O:	Optional serial or parallel
Disk Drives Inc:	Optional 5 1/4" floppy
Screen Format:	40x24
Graphics:	280x192 pixels
Sound:	Yes
Colour:	Yes
Keyboard:	Integrated
Software Included:	Variable; user's choice
Software Available:	Extensive
Primary Market:	Business or home
Manufacturer:	Arcomp Micro Systems
Available From:	Chen Koll Enterprises
Suggested Retail:	$799.00
Other:	Needs system card

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Corp., 224 Slater Road, Cranbrook, British Columbia (604) 489-5343 ● Datamex, 14 Leswin Road, Toronto, Ontario M6A 1K2 (416) 781-9135 ● DataTech Systems Limited, 135-5665 Kingsway, Burnaby, British Columbia V5H 2G4 (604) 437-3751 ● EMJ Data Systems Ltd., 291 Woodlawn West, Unit 3, Guelph, Ontario N1H 7L6 (519) 837-2444 ● Epson Canada Limited, 21 Progress Court, Unit 18, Scarborough, Ontario M1G 3V4 (416) 431-5588 ● Exceltronix, 319 College Street, Toronto, Ontario M5T 1S2 (416) 921-8941 ● Franklin ACE Canada, 1941 Leslie Street, Don Mills, Ontario M3B 2M3 (416) 449-9339 ● Fujicomp Inc., 6420 Victoria Avenue, Suite 3, Montreal, Quebec H3W 2S7 (514) 733-5612 ● Gladstone Electronics, 1736 Avenue Road, Toronto, Ontario M5M 3Y7 (416) 787-1448 ● GRiD Systems Canada, Inc., 895 Don Mills Road, Toronto, Ontario M3C 1W3 (416) 446-1555 ● Heathkit-Zenith, 1020 Islington Avenue, Toronto, Ontario M8Z 5X5 (416) 231-4171 ● Hewlett-Packard, 6877 Goreway Drive, Mississauga, Ontario L4V 1M8 (416) 678-9340 ● HiTECH Computer Systems, 4648-99th Street, Edmonton, Alberta T6E 5H5 (403) 437-0196 ● Irwin Electronics, 165 North Queen Street, Etobicoke, Ontario M9C 1A7 (416) 626-6600 ● JLS Computers, 67 Mowat Avenue, Suite 343, Toronto, Ontario M6K 3E3 (416) 530-4548 ● Kobetek Systems Limited, 1113 Commercial Street, New Minas, Nova Scotia B4N 3E6 ● Lanpar, 85 Torbay Road, Markham, Ontario L3R 1G7 (416) 475-9123 ● Micos Computer Systems Inc., 1295 Eglinton Avenue East, Cooksville, Ontario L4W 3E6 (416) 624-0320 ● Micro Bazzar, 23 Westmore Drive, Unit 5, Rexdale, Ontario M9W 3Y7 (416) 745-4740 ● Micro Computech Electronics Limited, 535 Queen Street West, Toronto, Ontario M5V 2B4 (416) 864-0332 ● MicroComputers of Canada, 3410 Midland Avenue, Unit 6, Scarborough, Ontario M1V 2N1 (416) 293-3885 ● Neilsen Computers, Inc., 275 Lancaster Street West, Kitchener, Ontario N2H 4V2 (519) 743-1830 ● Norango Computer Systems, Inc., 2025 Sheppard Avenue East, Willowdale, Ontario M2J 1V7 (416) 498-5332 ● NSN Options Limited, 250 Wyecroft Road, Unit 11, Oakville, Ontario L6K 3T7 (416) 842-6530 ●Office Equipment, 525 Denison, Markham, Ontario (416) 491-9330 ● Ogivar Inc., 958 Montee de Liesse, Ville St. Laurent, Quebec H4T 1N8 (514) 334-3632 ● Olympia Business Machines Canada Limited, 58 Prince Andrew Place, Don Mills, Ontario M3C 3A2 (416) 445-4212 ● Orion Electronic Supplies Inc., 40 Lancaster Street West, Kitchener, Ontario N2H 4S9 (519) 576-9902 ● Pacific Rim Electronic Imports, Inc., 13439-111 Street, Edmonton, Alberta T5E 4Z7 (403) 475-0555 ● Panasonic, 5770 Ambler Drive, Mississauga, Ontario L4W 2T3 (416) 624-5010 ● Peripherals Plus, 350 des Erables, Lachine, Quebec H8S 2P9 (514) 364-5554 ● Polytech International Limited, 1262 Don Mills Road, Suite 92, Don Mills, Ontario M3B 2W7 (416) 445-4270 ● Popular Electronic Products, 164 Kenneth Street, Suite 102, Duncan, British Columbia V9L 1N4 (604) 748-3222 ● Prelco Electronics, 2767 Thamesgate Drive, Mississauga, Ontario L4T 1G5 ● President Computer Corp., 540 Gordon Baker Road, Willowdale, Ontario M2H 3B4 (416) 492-1455 ● Progeni Computer Consultants, Inc., 285 South Centre Executive Tower, 11012 McLeod Trail South, Calgary, Alberta T2J 6A5 (403) 255-8722 ● Provincial Business Systems, Inc., 1262 Don Mills Road, Unit 72, Don Mills, Ontario M3B 2W7 (416) 441-2869 ● Radio Shack, 279 Bayview Drive, Barrie, Ontario L4M 4W5 ● Robin Hood Electronics, 20 Strathearn Avenue, Brampton, Ontario L6T 4P7 (416) 791-0025 ● Scarsdale Computers, 1 Scarsdale Road, Don Mills, Ontario M3B 2E2 (416) 441-1900 ● Semi-Tech Microelectronics, 100 Lombard Street, Suite 303, Toronto, Ontario M5C 2P2 (416) 475-2670 ● Spectravideo, 2913 Lakeshore Blvd. West, Toronto, Ontario M8V 1J3 (416) 252-4550 ● Sperry Inc., 55 City Centre Drive, Mississauga, Ontario L5B 1M4 (416) 270-3030 ● SGV Marketing, 1520 Trinity Drive, Unit 16, Mississauga, Ontario L5T 1T6 (416) 673-2323 ● Technical House, 343 Somerset Street West, Ottawa, Ontario K2P 0J8 (613) 236-6433 ● TEO Computers and Peripherals, Inc., 275 Steelcase Road East, Markham, Ontario L3R 1G3 (416) 474-9372 ● Texas Instruments, Inc., 41 Shelly Road, Richmond Hill, Ontario L4C 5G4 (416) 884-9181 ● Tomcat Computers of Canada, Inc., 6299 Airport Road, Suite 404, Mississauga, Ontario L4V 1N3 (416) 673-2040 ● Total Office Systems, Ltd., 1050 McNicoll Avenue, Unit 14, Scarborough, Ontario M1W 2L8 (416) 493-3575 ● TRW Data Systems, 270 Yorkland Blvd., Willowdale, Ontario M2J 1R8 (416) 491-9606 ● Unitron Computer Corporation, 6400 Millcreek Drive, Mississauga, Ontario L5N 3E7 (416) 821-3380 ● Universal Computer Systems, 6955 Lacordaire, Montreal, Quebec H1T 2K5 (514) 254-7810 ● Xerox Store, 703 Don Mills Road, Don Mills, Ontario M3C 1S2 ● York Computers, 98 Waverly Road, Suite 1, Toronto, Ontario M4L 3T3 (416) 364-2564

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Add CP/M to your 64



The Commodore 64, while a good basic machine all by itself seems to cry out for accessories from time to time. If you've noticed this and would like it to stop waking you up at three in the morning with its piteous wailing, try jamming its ROM slot with a Video Pak

by Steve Rimmer

As is the case with most home systems, one eventually does in the Commodore 64. Having played all the tunes one wants to hear, skipped sprites across the screen until the family XL 100 needs tube surgery and filled all sixty four kilobytes with code, the intrepid 64 owner may well find him or herself wanting to go beyond the limitations of that thin plastic case.

Unfortunately, the Commodore likes to speak in BASIC. It has a limited software library available for it and lacks such things as a business quality eighty column display. Most of the applications which are available for it are scaled down versions of packages written several years ago for larger Commodore computers and, as such, are not as slick as contemporary software running under other more powerful operating systems.

Now, this is not... at least theoretically... the teetering edge of the precipice into which old technology ultimately drops. The hardware of the 64 may not be able to go where you want it to by itself... but there is at least the prospect that it can be taken there by adding some additional fiberglass and silicon.

The Data 20 Video Pak, distibuted in Canada by Marketron, is a plug-in doo dah which adds a number of interesting things to your 64. The best of these is an eighty column display. Perhaps more promising still, although ultimately less fulfilling, is the disk which comes with the package and permits the 64 to run under CP/M.

Sort of.

Disks

The Commodore 64 is based on the 6510 microprocessor... you'll invariably have noticed this in the manual, as they seem to be extremely proud of it. Neat though it may be, it is absolutely incompatible with the 8080 processor and the newer Z-80 for which CP/M, and all CP/M software, have been written. All CP/M based software will do virtually the same thing on a stock 64 for this reason.

It will crash.

It is, however, possible to put a Z-80 into the 64 to work along with the 6510. In essence, the new processor does all of the higher level computing functions and leaves the now disgruntled 6510 to handle the rudimentary I/O and machine dependant stuff. There are catches to this, of course.

Now, having got the right chip happening in the 64, one can run the CP/M operating system. In fact, the one which we'll be looking at here, the one which comes as part of the package, is not real CP/M but, rather, one which imitates the function of the real thing. There is an important difference.

If your 64 has been your only exposure to computers you may not really have your head around exactly what CP/M is, or why you really want it. It's a bit of a leap from the fairly safe world of Commodore systems, as these computers never make you work at the level which CP/M regards as its normal operator environment.

When you turn your 64 on it immediately runs Microsoft BASIC. If you wanted to use the computer to process words, for example, you would want to get out of BASIC, disable it so as to free up the memory the interpreter normally munches and then load in and run a word processing program.

There's nothing wrong with this. In fact, it makes for a really user friendly environment. CP/M, however, works in rather the opposite way.

When you boot CP/M you get what is called a command line. The usual form of this is a letter followed by a right arrow head. This tells you that you are on disk drive A. Drive A will have what are called command files on it... hopefully... which are, in effect, programs.

BASIC is a command file. Assuming that you have BASIC on the disk if you typed BASIC you would find yourself in the CP/M equivalent of what the 64 launches you into immediately upon powering up. However, there are many other CP/M based applications to use... you can call up whatever you want from the command line prompt.

What makes CP/M so powerful is that it is an "operating system". It allows you to deal with programs in a simple, concise format. However, there's another advantage in using it. CP/M can be looked upon as a sort of computer translator. It translates the input and output requests from CP/M based software into terms that your computer can

understand. This allows software written under CP/M to function pretty well identically on any computer running this operating system right out of the box. The CP/M itself is different... every computer has its own version... but it looks identical to the program running under it.

This has made a vast amount of software available for CP/M based systems.

The really exciting aspect of the Video Pak, then, is its ability to tap into the huge volume of software available to run under CP/M.

Temporal Concerns

To make CP/M happen on the 64 you plug the Video Pak into the ROM slot of the system, a power pack into the Video Pak and a cable from the Pak into your tube. The system will provide either a forty or eighty column screen display... the latter is a decent thing if you have a monitor instead of a broadcast type TV.

At this point, turning on the 64 will bring up the usual prompt. The Video Pak is still sleeping. You can, first off, wake it up in the Commodore BASIC mode using straight system calls. For example, SYS 36867 will turn on the eighty column display. Thereafter, your computer will have a very dense, readable, snappy looking screen which behaves just like that of the 64 but is twice as verbose.

The eighty column mode of the Video Pak is not quite transparent to the 64. In other words, some of the aspects of the system will behave a bit differently when you're using it. For example, you cannot edit strings of control characters on the screen once they have been entered with the eighty column screen happening. The cursor doesn't snuff itself while programs are executing. On the other hand, using the cassette recorder doesn't blank out the eighty column screen.

The Video Pak also adds such things as "erase to end of line" and "erase to end of screen" features... they're activated by function keys. You knew those little freaks were good for something, didn't you...

Using the Video Pak as a simple adjunct to BASIC programming is a fairly reasonable trip and, if you can pop for one it's probably worthwhile for this function alone. It makes the system a lot kinder to your brain when you're working on large programs or applications that do a lot of screen juggling as you can get lot more information on the glass at one time.

The other face of the Video Pak, CP/M, is nowhere near as straight forward. To begin with, its use absolutely presupposes the possession of a VIC 1541 disk drive. You make it happen by running a booting program from the supplied system disk... and the drive is scarely still after that.

The boot program is called SB80. It is, in fact, not CP/M... it doesn't even come from Digital Research, the company which makes CP/M. It's done up by Lifeboat in New York, a company which makes a great number of CP/M packages for assorted computers. It's written so as to perform all of the functions of CP/M and look like the real thing to any programs you feel like running on the system. However, it omits some fairly important aspects of the standard CP/M package.

If you buy CP/M for another system... for example, we have Lifeboat CP/M for our TRS-80 Model II... you get a disk with the operating system *and* a dozen or so command files. These are called "utilities". They're used for copying files onto other disks, seeing how much space is left on the disk, configuring the system and, most important to most home users, assembling machine language programs to run on the system.

The utility consignment of the SB80 package is very sparse. It comes with a few disk programs for status and directory functions and enough software to allow one to back up the master but precious little else. The most missed aspects of its software void is the lack of any programming facilities at all. Lacking even a machine language debugger... what Commodore users call a "monitor"... the disk offers no way to write enough code to get more software over from another computer.

In the time it took you to read the above digression the SB80 package would have managed to switch on the eighty column screen display if you had not already done so from BASIC and get about three quarters of the way through its booting process. Sitting in front of the thing watching the disk light be red, one's mind starts to free associate words. Ones like "eternity", "glacially slow" and "tedium of the gods" came into mine.

CP/M on the 64 is painfully, mind scorchingly, drearily slow.

In fact, this is a fault of neither the SB80 package nor the Video Pak. Commodore computers have torturously slow drives. There's even a practical reason for this... they're serial, you see, while most other disk



The pak plugs into the back of the 64

Add CP/M to your 64

systems use parallel interfaces. In a grossly simpified sense in the time any other computer can transmit a byte to or from its drive a 64 can move one slimy little bit. As such, several milli–eons can pass while large files crawl into the system.

When you finally get to see the CP/M command line things look very CP/M like, but for this strange reversed out bar which insists on living at the bottom of the screen. Its primary aspiration appears to be to tell you which track and sector of the disk is being read at such time as the red LED is glowing. This is not a completely useless function... it's good to know that something is actually happening when one is engaged in a particularly extensive disk access.

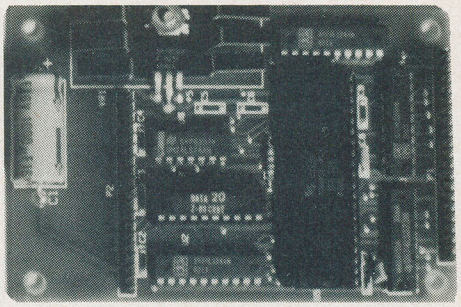
Less Than Adorable

The CP/M package for the Commodore 64 is an interesting implementation of an operating system. Considering the limitations of the hardware it runs on it is not a half bad thing. However, it will not turn your plastic computer into a business system and it will not give you access to the full library of professional quality software which is happy on CP/M based systems... at least, not in any useful way.

The slowness of the Commodore's disk system eliminates a great deal of the software which will run on other CP/M based systems. Most sophisticated packages use a lot of disk accessing to do their things. They keep scratch files, have overlay and function files and do searches on the disk. The trickle of data which can make its way through the 64's disk interface makes the prospect of using these things reminiscent of simply doing whatever you're up for by hand.

If you are already used to the 64's languid drives the speed at which SB80 runs simple programs probably won't bother you too much. As such, the package is not a bad trip for 64 owners who want to dabble in Z—80 progarmming and simple CP/M based software.

This, however, has a catch in itself. Any resemblance between the disk format of VIC 1541 drive and that of any other CP/M based computer living or dead is purely coincidential. As such, you can't just buy software for another system and pop it into your machine. Since SB80 comes with no editor, assembler or, in fact, any machine language tools it isn't particularly easy to work out a way to port software over from another computer even you have one and don't mind doing it the hard way.



The distributor of the Video Pak was working on making a variety of software available for the system when last we spoke... however, one would be well advised to make sure that the packages that one wanted were available prior to the deposition of one's pelf upon the counter.

The documentation which comes with the package, as it pertains to SB80, is diminishingly minute. There is a large SB80 manual available from Lifeboat. If you are considering buying the Video Pak and using the CP/M aspect of it you'll pretty well have to pop for this. If you understand CP/M to begin with the two sheets with come with the disk will just get you to the point wherein you can get the thing booted. If all of this is as yet a mystery to you prepare for confusion without the manual.

No Miracles

Table 1

Among the software available for the SB80 system are:

ALEOL-60	FORTH	Wordstar
Backgammon	Fortran-80	ZAP-80
BASIC	Infor Star	ZSID

Software Review

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③ **LODE RUNNER,** Broderbund	40.50
④ **ZAXXON,** Datasoft	45.95
⑤ **ENCHANTER,** Infocom	56.95
⑥ **SARGON III,** Hayden	62.50
⑦ **BROADSIDES,** SSI	47.50
⑧ **SUPERBUNNY,** Datamost	34.50
⑨ **MURDER BY THE DOZEN,** CBS	35.95
⑩ **ZORK I,** Infocom	45.95

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Apple II User's Guide	24.50
Beneath Apple DOS	25.95
P Source	32.50
Apple Circuit Description	32.50
Nibble Express III	23.95
Apple Almanac	25.95
Using 6502 Assembly Language	25.95
Games Apple Play	19.95
Elementary Apple	19.95

ULTIMA III, EXODUS

Origin Systems Ltd.

Just when you thought it was safe to go back into the black fortress of Minax, it is discovered that the evil wizard's apprentice is even more cunning and treacherous than was his mentor.

POGO JOE

Screenplay

Similar to the arcade-game Q-Bert, Pogo Joe jumps around on a stack of cylinders. A computerized version of Humpty-Dumpty.

ATARI TOP TEN

① **DONKEY KONG,** ATARI (c)	$58.95
② **BLUE MAX,** Synapse (d,t)	40.50
③ **SAIGON,** Adventure Int'l. (t)	30.50
④ **HARD HAT MACK,** Elect. Arts (d)	46.50
⑤ **ZEPPELIN,** Synapse (d,t)	40.50
⑥ **MR. ROBOT,** Datamost (d)	40.50
⑦ **ARCADE MACHINE,** Broderbund (d)	68.95
⑧ **CRISIS MOUNTAIN,** microfun (d)	41.50
⑨ **TRION,** London Software (d,t)	44.50
⑩ **ENCHANTER,** Infocom (d)	56.95

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SAVE NEW YORK

Creative Software

Space mutants are threatening to eat up New York, (the Bronx is the best part), but you can destroy them from your rocket ship and save the Big Apple. But don't run into any of the buildings, or you can kiss your Apple goodbye!

ZEPPELIN

Synapse Software

Fly your zeppelin through twisting caves fraught with dangerous obstacles and hostile entities.

THE ARCADE MACHINE

Broderbund Software

A must for the serious video game designer! Create your own game with no prior programming knowledge. Draw shapes, animate them, make explosions, sound effects, and more with this innovative package.

COMMODORE TOP TEN

① **STAR TREK,** Sega (c)	$41.50
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⑤ **ARCHON,** Elect. Arts (d)	52.50
⑥ **ZORK III,** Infocom (d)	45.95
⑦ **SAVE NEW YORK,** Creative (c)	42.95
⑧ **MUSIC CONST. SET,** Elect. Arts (d)	52.50
⑨ **POGO JOE,** Screenplay (d,t)	36.50
⑩ **CASTLE WOLFENSTEIN,** Muse (d)	36.50

BOOKS

Comm. 64 Prog. Reference	$27.95
Comm. 64 Games	18.95
Comm. 64 Graphics	18.95
Comm. 64 Sound & Graphics	18.95
Compute's 1st Book of 64	18.95
Elementary 64	19.95
Kids And The 64	25.95
Comm. 64 Prog. For The Home	21.50
How To Use Comm. 64	5.95
I Speak Basic To My Comm. 64	16.95

SUPERBUNNY

Datamost

What kid hasn't dreamed of becoming a superbunny? Just hop on the conveyor belts of this Frogger-type game and grab the carrot away from the coyote. One of the perquisites of being a superbunny is that you get to punch out all the other animals on the screen. Lavishly illustrated, plainly written documentation (comic book) is included.

MUSIC CONSTRUCTION SET

Electronic Arts

Using simple graphics, you can compose your own music and then hear it played back on a synthesizer. Now, how do you get to Carnegie Hall ... ?

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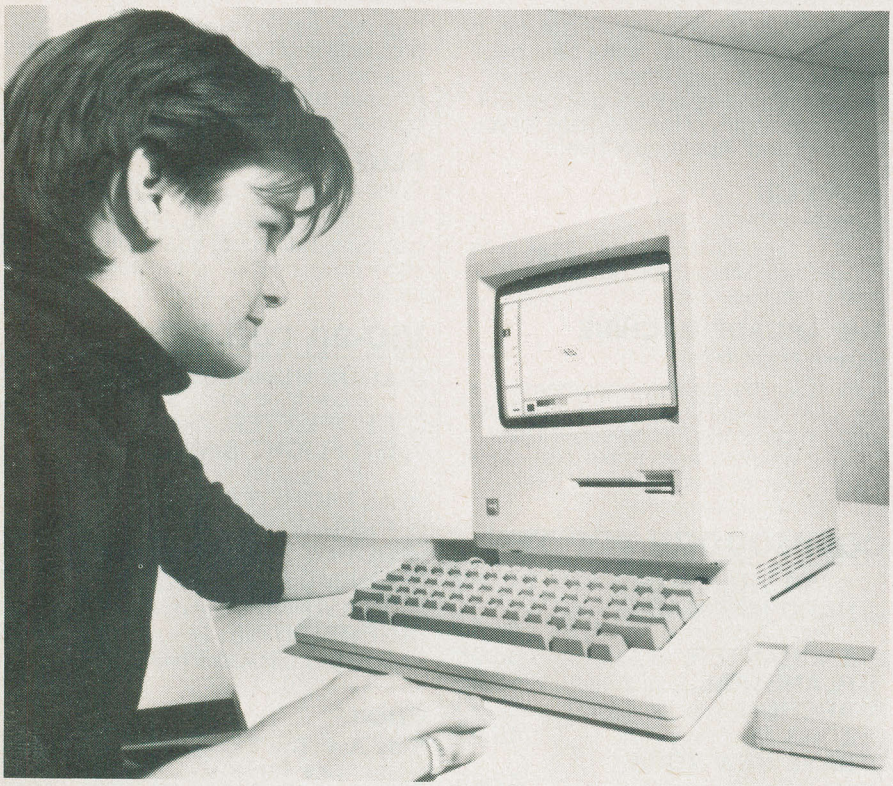
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Macintosh Review



scrambles across the screen really effortlessly and with a high degree of user control. As such, you can do freelance drawing with it and get what you had in mind... instead of an aerial view of a drunk driving home.

The system has an "undo" feature which allows one to reverse the most recent thing one has wrought upon an image if one finds that it's uncool.

One can draw using most of the usual features available in software art packages. You can specify lines, shapes and solids, do fills and so forth and plot individual points. One of the package menus, "goodies", allows you to do things like take one small part of your drawing and expand it to handle freaky details.

The most interesting feature of the drawing package, however, is its airbrush. Ahem, yes, no computer art is complete without an airbrush. This one actually works like a real spray gun, laying down graduated tones. However, it goes beyond this. The system provides a large number of textures for fills and backgrounds. You can have bricks, grass, tweeds and so forth. You can also air brush these patterns on the tube. It's an effect that's not that easily imagined... think of wallpaper in an aerosol can.

"Show them the fish." Ed suggested. Bill moused over to a menu, clicked the thing a few times and the drive whirred. This amazing high resolution fish showed up on the tube looking like it must certainly have been done with a technical pen on paper. Horatio caught sight of it and pounced at the Mac. It was only by moving extremely quickly that I succeeded in stopping Ed from bludgeoning the cat with a chair as Bill's forty-five became stuck in his shoulder holster. The cat shrieked and split for parts unknown.

"It's the only one we've got right now." Bill noted in an almost apologetic tone, holstering his gun.

For Sale Or Lisa

While the Mac has been described as a sort of poor man's Lisa, I think this is extremely misleading. For most applications I think it would probably be a preferable machine. It's much smaller and lighter. It's also faster on its feet and, while its software does not have quite as many bells and whistles as is found within the case of the Lisa, this is offset by the Mac's speed.

In addition, of course, the Mac is very much more affordable. It costs less than an IBM PC. While one can argue that there is less software available for it... all we've seen so far has been the two Mac packages and Multiplan... if your trip happens to be one of the things that the system is up for the PC can't lay a finger on it. This isn't true just because PCs don't come with fingers, either.

The folks at Apple are sure, of course, that there will be a huge library of software available for the Mac in a few months when all the third party entities get done turning out packages for it. They're probably right. The Mac when seen simply as a box full of neat hardware makes a fiendishly powerful computer for which to write stuff.

The Mac is unquestionably the easiest system we've ever come across in terms of use and comprehension. It was clearly designed by geniuses to be used by idiots... instead of the other way around. While it's capable of doing great things once one gets used to it, it can also be managed even if you're all new to this stuff.

"Well," I said, leaning back from the console. "It's a trip. I've gotta split, though. If I stay here much longer the vampires'll be out."

"Great," said Ed. "We'll see you tomorrow."

"Oh, you don't have to do that. I think I understand it pretty well. You guys can just come back and pick it up when we're done with the review."

Bill pulled out his gun again. Horatio measured the distance between his furry little carcass and the nearest exit. "We can't leave." he said sternly.

"Huh?"

"We have to stay and guard it."

"The computer?"

"We have a camp bed in the car and two weeks worth of freeze dried food. Where it goes, we go."

"You're going to stay here for two weeks just to guard the computer..."

Ed looked lovingly at the Mac. "It's the only one we've got."

The Apple Macintosh is now available from most Apple computer dealers with a suggested list price of $3595.00. The Mac and the Imagewriter printer are listed at $4295.00. Both packages come with MacWrite and MacPaint software.



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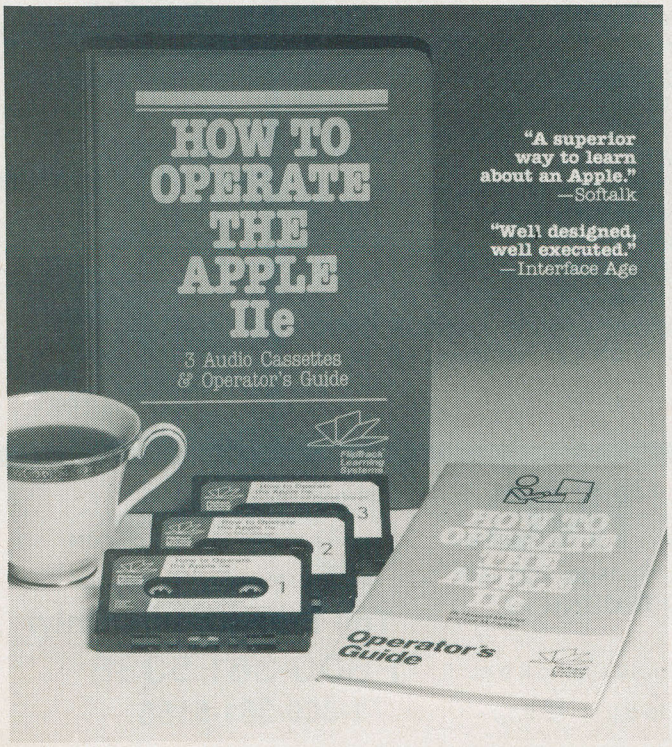
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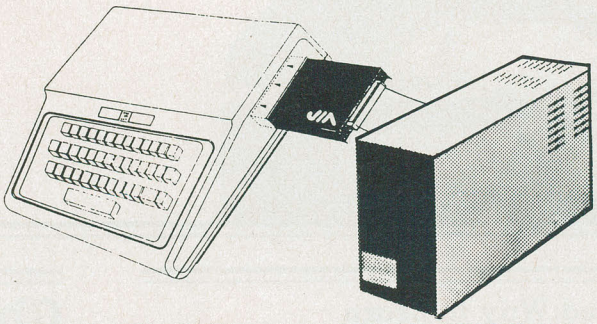
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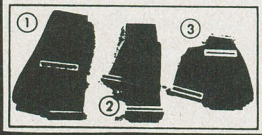
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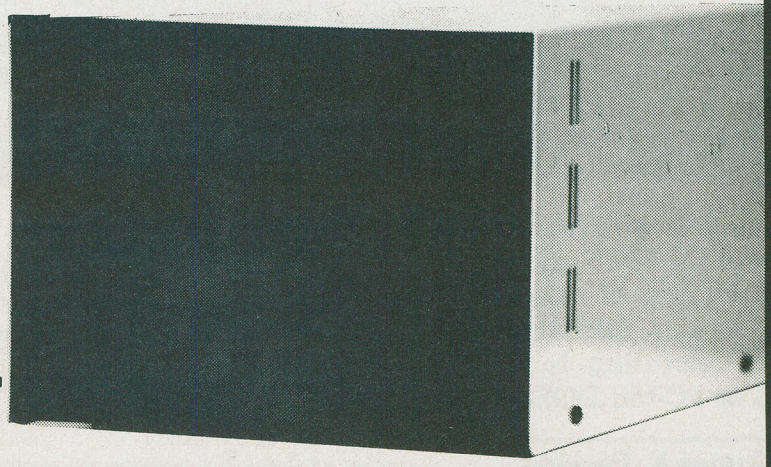
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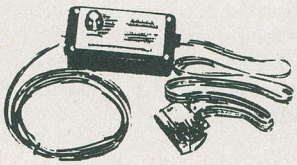
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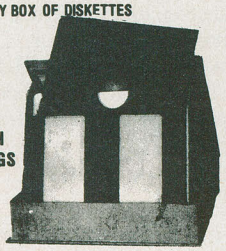
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Three Packages



Executive Software has developed three software packages that are worthy of consideration by serious micro-computer users operating in CP/M, CP/M 86 or PC-MS DOS.

by James K. Perkins

Ready-Writer is a Wordstar like word-processing software package with a difference; it's decidedly less costly. Decision Analyst, is an executive analytical tool. Forecast 80, a MultiPlan act alike for business finance analysis completes the trio of packages authored and marketed by Bey Reed of Barrie and his Dover, Delaware business partner Willis Sargent. Though the programs are not 'integrated' like Lotus 1,2,3 or its counterparts, the programs clearly bear the imprint of the authors and derive from the same family.

Write On

Ready-Writer is at the heart of the software. Its original purpose was to support the Plan 80 program in much the same way that Wordstar supports M Basic. It creates the text statements which form the spreadsheet structure. However, Ready-Writer, with special features like auto indent and its undelete function, is sufficiently powerful that its virtues merited marketing in its own right.

Admittedly Ready-Writer has its limitations. It is not part of an integrated system and lacks a mail merge facility and a spelling checker for example. It limits the text length it will support to twenty four thousand words for my Epson QX-10 and other eight bit CP/M machines and sixty thousand words for sixteen bit machines. Those limits are not inhibiting, however, since a user can chain files and parts of files with ease by using the block command to get around the file length limitation.

As a user of CP/M 80 and Wordstar, I felt immediately at ease with Ready-Writer's command structure. I was struck by the similarities between Ready-Writer and Wordstar. While there are significant differences, the truth is that Ready-Writer possesses features which Wordstar lacks, and seems to lack only a right adjusted text feature to match it. Ready-Writer has clear and instructive header prompts, and reverse video flashing modes. I confess, however, that I inadvertantly tried to use my QX-10 arrow keys instead of the "e," "s," "d," "x" diamond the first time I tried it. It is worth emphasizing that I neither lost nor locked up the program, so the result was only momentarily traumatic.

Because of its likeness to Wordstar, the command structure of Ready-Writer is peculiarly non-ergonomic. I frankly doubt that I shall ever get the hang of using the control key and K or Q keys with my left hand at the same time. Like CP/M, it may not be perfect, but it is the standard.

When all is said and done, Ready-Writer is a superb performer. For a second system word processor on which to accommodate the back up CP/M system on my Epson QX-10, it must be considered superlative. It will suffice as a first system for all but the most demanding user. At around fifty dollars, it is second only to software piracy in terms of its price and performance.

Docs

The Ready-Writer documentation comes in two attractive thin soft covered volumes of about thirty pages each. The first deals with installation of Ready-Writer, and is aimed at the neophyte user with no previous CP/M exposure.

The documentation leads the new user

through formatting, copying, installing and providing backup disks for use. In addition, two first rate tutorial lessons are offered to assist the unfamiliar. Even I had no difficulty getting the program up on the first try. In fact, it took me less than two hours to review the installation manual, follow its readily understood step by step direction to format and copy disks, PIP the needed programs onto the working disks and to run through the two tutorials.

Several features are noteworthy about Ready-Writer. It displays a prompt header which provides all the information any user needs to know about the status of the current program. Figure one illustrates and explains the header prompt line. Taken from the manual, it is also illustrative of the clarity of documentation. The manual was prepared using the Ready-Writer program and, while it is not in the same quality class as the presentation of Decision Analyst and Plan 80, it effectively illustrates the utility of the software.

To enter Ready-Writer from CP/M, one need only type RW. Opening a file is equally easy. Strike, E for Edit Mode from the three menu choices offered. (The other two are P for Print and X for Exit to Operating System.)

Ready-Writer possesses features which Wordstar lack ...

The dot commands are used to format documents for printing. I particularly liked the CPM command which directs Ready-Writer to start a new page if fewer than a pre-determined number of lines remain to the end of a page. This is quite different from setting the foot from the end of text to bottom of a page and is useful for breaking long quotes or complex thoughts where you wish to. Since the dot commands apply only to those portions of text following their insertion, Ready-Writer will support complex formatting requirements with considerable ease.

One unique feature which I found particularly useful is the undelete command. It allows recovery of up to five hundred characters of deleted text. Since I use my machine to draft and edit reports, it is not unusual for me to change my mind after deleting an idea or thought. Ready-Writer's capacity to recover that thought saves me considerable typing.

The auto indent feature permits writing structured programs and setting up financial models with significant ease by using the arrow key diamond and space bar and auto indent to reformat.

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Three Packages



Decision Analyst

Decision Analyst is described as "an executive tool for analyzing complex decisions involving many alternatives." It is truly described. It is one of those programs that initially leaves you dubious about its potential since it deals with the decision making process in a subjectively quantifiable context only. While alternatives are weighed and scored from criteria which levels of importance and percentage values have been assigned, the subjectivity of the process left me initially uneasy. However I used the program with some decisions I had already made without its benefit. It is always nice to know you have done the right thing and I found out that the program works as advertised and that I did the right thing by renting out one of the office in the suite I lease to another consultant.

Make no mistake; it is the rigorous application of deliberately structured decision process that makes for Decision Analyst's "magic." The program is not a number cruncher, although it will do that too. Rather, it is a thinking aid. It forces the user to sort out and weigh criteria and their consequences as they apply to any given set of decision making data.

If forces the user to sort out and weigh criteria and their consequences...

Since I am used to quantifying decisions and measuring their exposure to error and its probabilities, I was pleased that Decision Analyst included a Murphy's law analysis which forces the user to contemplate possible problems and their consequences to provide an assessment of probabilities of those problems and requires the user to provide fall back positions or limited contingency analysis' in the event of a problem having come to pass.

The examples in the documentation along with suggested uses for Decision Analyst reflect the diversity of the potential uses to which the software is addressed. While it is not the stuff of which governments clandestinely analyze war games, Decision Analyst, according to the authors, was borne from the necessity of reaching a marketing decision.

Plan 80

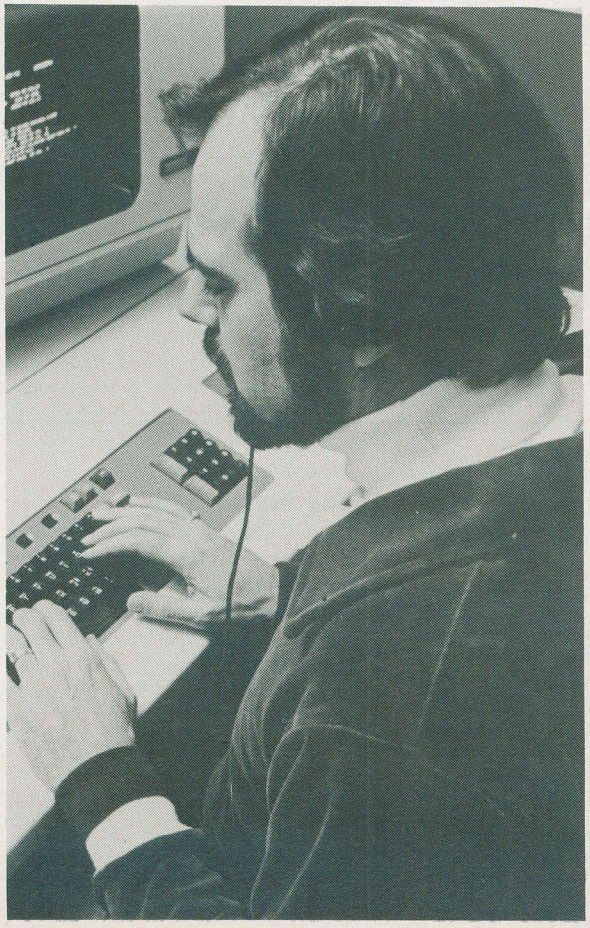
To establish its credentials as a heavyweight contender, Plan 80 must be able to do battle successfully with the likes of Lotus 1,2,3 or Context MBA on even terms, with their impressive integration of graphics and database, with SuperCalc 3 and its superior graphics management component and with the next generation of spread sheets Visi-On. Well, Plan 80 works on CP/M micro processor hardware and none of the above mentioned group can make that statement *and* Plan 80

works on CP/M 86 and MS DOS systems too.

In addition, Plan 80 Version 2.6 includes a full range of math functions including roots, trigonometric and logarithmic functions, financial functions for various depreciation methods, internal rate of return and amortization and it has a table look up function.

Plan 80 control statements include PUT and GET, which quite literally puts data on and gets data from disk files, while FOR determines which data is sent and were it is put

```
+-------------------------------------------------------------+
| ^QA name.typ  LINE=nnn COL=nn  FC=nnn AV=nnnn  INSERT (1,65) |
| (1)   (2)       (3)     (4)    (5)    (6)       (7)   (8)   |
|                                                             |
| (1)   Most recent command if not done executing.            |
| (2)   Name of file you are editing.                         |
| (3)   Line number relative to begining of file.             |
| (4)   Column number.                                        |
| (5)   File character relative to begining of file.          |
| (6)   Amount of memory available in bytes. (Each character  |
|       requires a byte.)  A warning 'beep' sounds after every |
|       keystroke when less than 200 bytes are available.     |
| (7)   Show the word "INSERT" when in insert mode.           |
| (8)   Show left and right margin settings unless INDENT or  |
|       ADJUST modes are ON.                                  |
|                                                             |
| Rightmost column is called the INDICATOR column      ---->  |
|   * Indicates BEFORE begining of file .....            :    |
|   * Indicates HARD carriage return .....               <    |
|   * Indicates SOFT carriage return .....                    |
|   * Indicates line longer than screen is wide .....    +    |
|   * Indicates AFTER end of file .....                  .    |
|                                                             |
+-------------------------------------------------------------+
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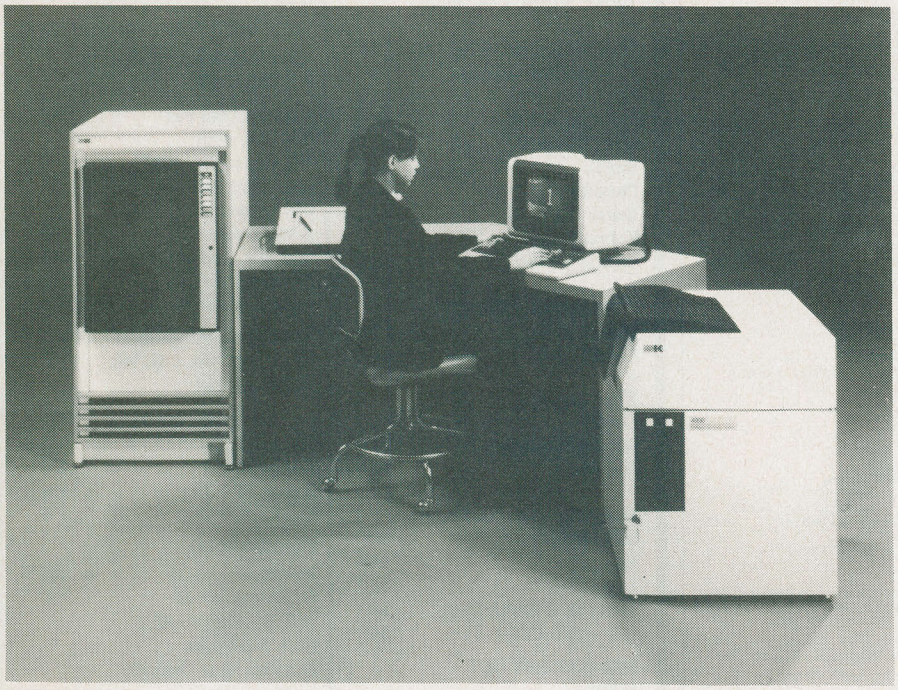
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Y .       |                                                  type scatter
- .       |                                          1       "y" axis
A .       |                                     1              row1  SALES
X .       |                               1                    row2  NET
I     800 +                         1                        row3  none
S A       |                   1                              upper none
  N       |             1                         2          lower none
H D       |       1                                          heading
E         |   1                                             "x" axis
A C   600 +1                                    2              first F1981
D O       |                                                  last  F1989
I N       |                               2                  columns
N T       |                                                  upper none
G U       |                         2                        lower none
  A   400 +                                                  heading
  T       |                   2
  I       |             2
  O       |       2
  N       |2   2
      200 +--------+--------+-------+-------+-------+
                                Last Column Shown: F1989
(ESCape,D-isplay,SPACEBAR,<,>)
```

when received. In much the same context it is able to consolidate all or parts of data from other files. That is pretty powerful stuff. Combined with a two hundred and forty row by nine hundred and ninety nine column potential it has more muscle than most eight bit micros can cope with.

Plan 80 possesses an easy to use options command routine which establishes the format of the finished product. Its appearance is truly finished. It can assign up to forty characters of column description in each of several rows.

Plan 80 includes a graphics capability. It will run scatter, bar and cumulative bar and scatter charts on both dot matrix and daisy wheel type printers. That flexibility robs the graphics of the precision plot character and professional presentation qualities that are supposed to go with SuperCalc 3, but then I can't currently purchase SuperCalc 3, let alone run it on my Olivetti ET 221 typewriter cum electronic printer. With that plus, I will settle for what must be regarded as primitive graphics. If the graphics are technically primitive, however, there is nothing primitive about plots that will permit me to display up to fourteen variables on a given chart.

The Plan 80 documentation and advertising stakes its special strength as the natural expression of values and structure of financial programs, rejecting the "artificial" quality of coding cells. Rather than, SUM (A1:A6), it is possible to command the program to "ADD REVENUES". That difference in approach is the fundamental difference among the two major classes of spreadsheets. Once again, Plan 80 seems to support the superior approach.

Reference has been made to the relationship between Ready-Writer and Plan 80. In fact, any competent text processing software will support Plan 80. That includes Epson's Valdocs system. However, Valdocs uses a full three hundred and fourty kilobytes of disk in drive A, and after putting Plan 80 on the drive B data disk, there is precious little room left for Plan 80 storage.

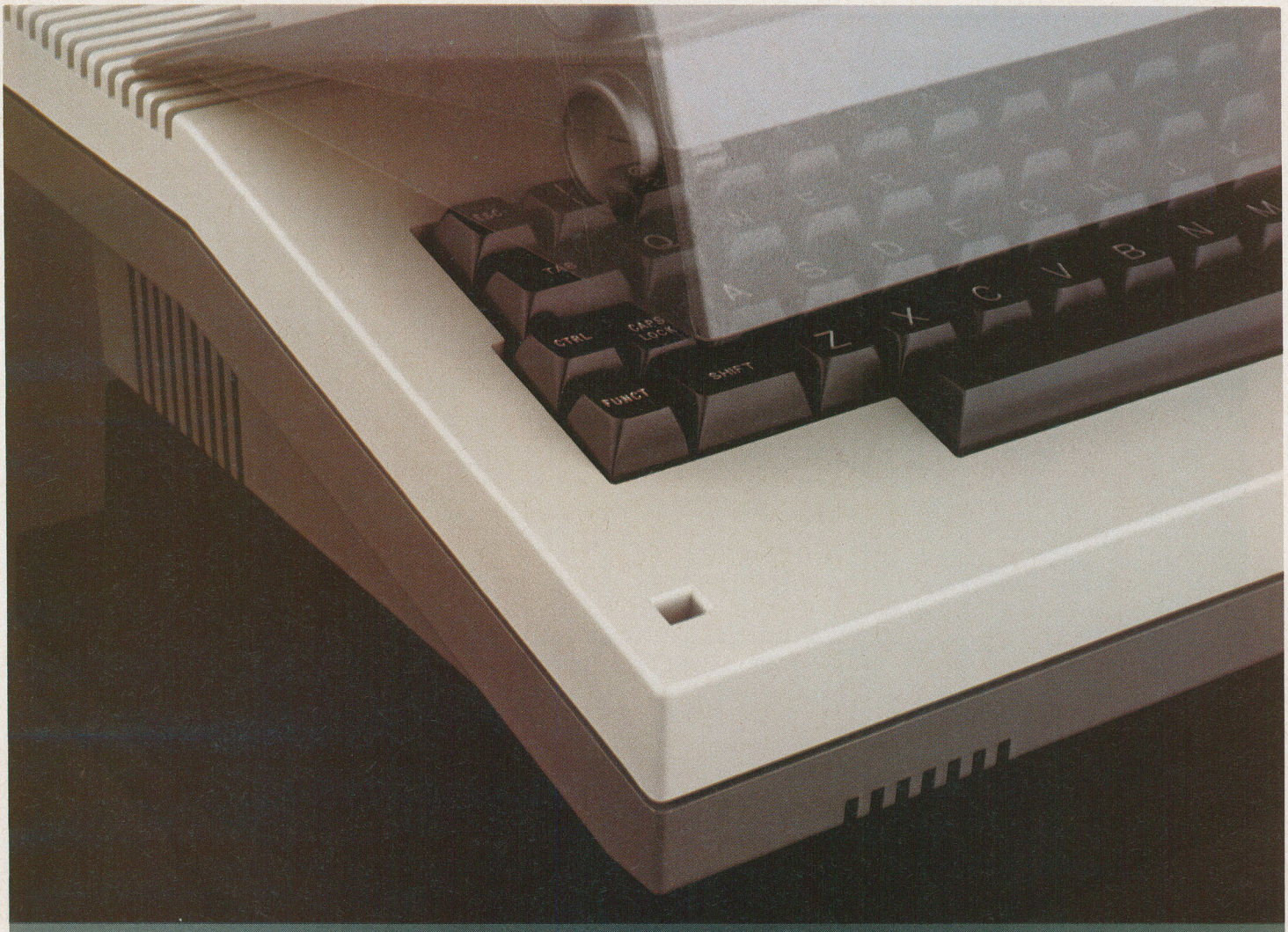
The least desirable features of Plan 80 are the data input and display modes and the cursor moving and redisplay modes. It is clumsy for an otherwise classy system to use a keyboard diamond to move the cursor. Moreover, the command structure bears little relationship to the command functions. For example, the command, "5*110%:99K" will enter "5.5," "5.5," and so on up to ninety nine columns. Nonetheless, it makes little sense to use natural descriptors to set up a forecast or balance sheet only to use an artificial syntax to input data to it.

The Bottom Line

Ready-Writer, Decision Analyst and Plan 80 all reflect a conscientious effort of well thought concepts by individuals, one of whom is a Canadian businessman. The software is uniformly good user friendly and possesses a high order of capacity to do a job. I do not know of a similar product to Decision Analyst on the market.

The products are sufficiently user friendly that I was able to operate the programs successfully, even experimentally, after only a few hours of practice and documentation review. The documentation is as good as the products themselves. As a result, I never felt intimidated by the programs, as I have so often before.

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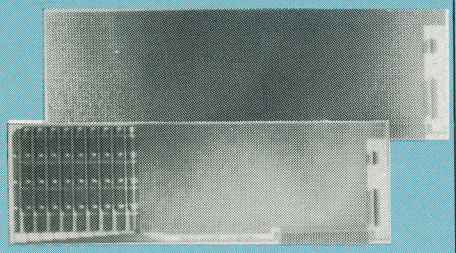
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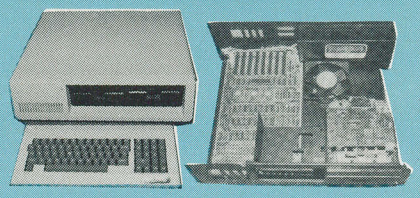
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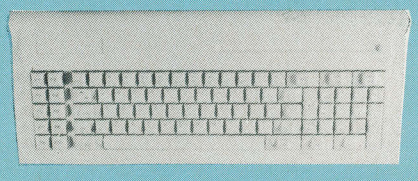
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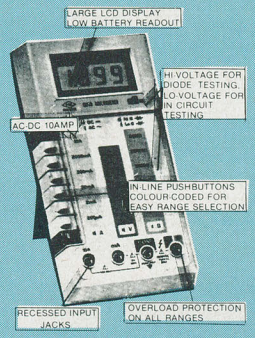
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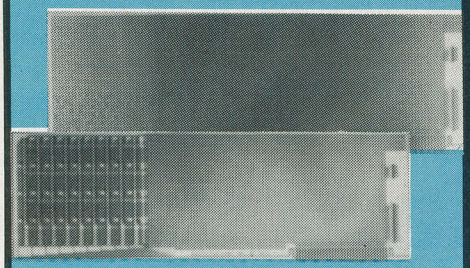
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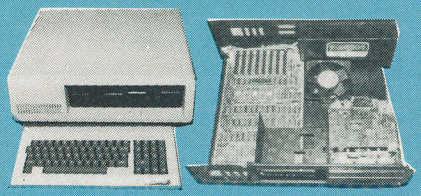
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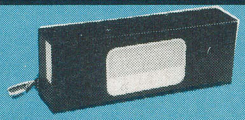
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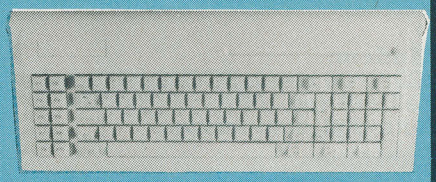
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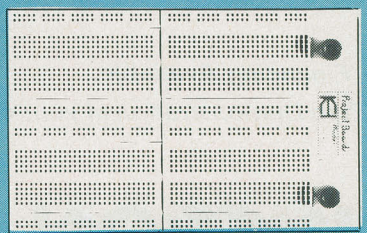


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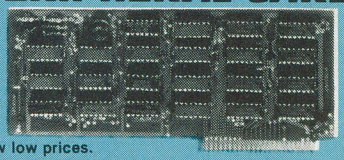
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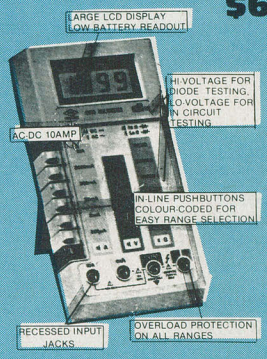
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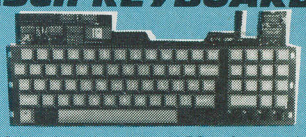
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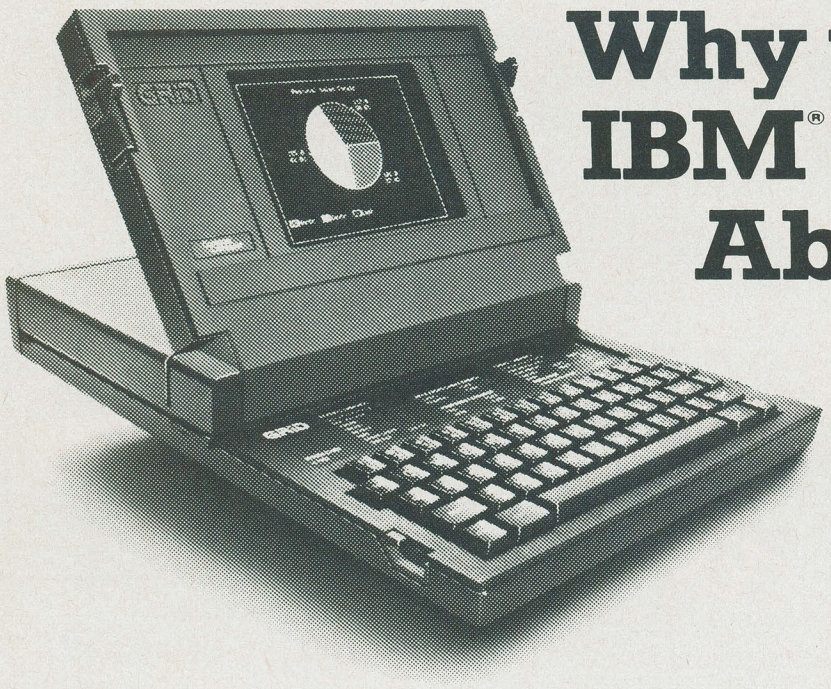


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Assembler on the IBM



Programming the IBM PC at the machine language level was once thought to be a task suitable only for the loftiest beings. However, in these secular times you can be lofty with nothing more than a couple of disks and a few pages of instructions. Take these, for example.

by Steve Rimmer

Assembler on the IBM

If you've recently become the owner of an IBM PC... or something which at least thinks it's one of these powerful new machines... you've probably discovered that there are a number of applications for which clever little routines in BASICA just don't cut it. Serious programming requires serious tools and either some heavy duty insight into your system or enough illicit substances to make it all appear as the cosmic one.

The cosmic one being, in fact, an integer and, as such, of highly limited precision, we're going to have a look at the beginning of insight into that very weird little dimension of assembly language programming on the IBM PC.

Grab your yarrow sticks and beads.

DIRections

Depending upon how you approach it, programming the PC at the assembly language level can be seen as being either an order of maginitude more difficult than writing code for eight bit deals like the Z-80... there's a heap of bowing and scraping involved in making the 8088 work... or unspeakably simple, inasmuch as a lot of the stuff people used to write involved routines for is done by single op codes on the 8088.

One of the neatest examples is this one. Here is an 8080 style division routine

```
DIVIDE    MVI   B,21
          MVI   C, O
          STC
          CMC
LOOP      SUB   B
          JC    DONE
          INC   C
          JMP   LOOP
DONE      RET
```

It divides the number in the A register by twenty one, leaving the results in the C. On the 8088 this would be done

```
DIVIDE    MOV     SI, 21
          DIV     SI
          RET
```

Sharp, isn't it.

In fact, machine language with the 8088 is right up there with some of the simplest higher level languages in terms of what you can manage with one line of code. In many ways it starts to look like C after a while.

However, learning to work with this wonderful facility requires that one become familiar with three fairly brutish looking monsters, to wit, MS DOS, Macro 86 the nasty macro assembler and, of course, the 8088 itself. While not as horrid as it may sound, this combination provides one with rather a greater challenge than would confront a programmer verturing upon the Z-80 running CP/M for the first time.

This article will, sadly, not make you into a brilliant assembler programmer all by itself. The publisher just wouldn't spring for the seven hundred pages we figured we'd need to do justice to the topic. However, it'll get you started and give you some code to play with.

To begin with, if you've read anything about the 8088 you'll have discovered that, while it can cheerfully access up to a megabyte of memory it doesn't exactly do it as one would expect. In fact, it handles each address as a sixty four K block and a segment address to tell things where in the one megabyte the sixty four K will live.

I have never written an assembler program which yielded more than sixty four K ot code and I think it highly unlikely I ever will. Therefore, in the interest of keeping things simple for the moment, we are going to ignore all of this segment footwash and simply make the computer behave as a normal sixty four K system... at least as far as the code is concerned.

The code we're concerned with today is program one. It's a program called D. Its reason for being is that there is a similar program called D which produces a sorted directory listing for CP/M based systems and I have gotten used to typing "D" when I want a directory of the disk.

This gives you an error message on a PC if you haven't got something called "D" to run. Hence, we have this little wonder. It doesn't actually do any sorting here because I stripped out the bubble sorter to keep it from looking intimidatingly huge. However, it still figures out the sizes of the files on the disk and presents the whole mess in a way which is much more useful than the one done by DIR.

Run For Your Life

The first actual running code in program one happens down at what I've called the handshaking section. I'm not going to explain what this does in detail... it functions to tell the 8088 where each of the four sections of its logical memory reside within the computer's physical RAM. Suffice it to say that if you stick in one of these before the running code of any small program you can ignore all the segment hassles.

Prior to the handshaking code we have the program's data. The system cares where you put the data, actually... you shouldn't just scatter it through the code as is often done by Z-80 programmers. Under the 8088 strings and stashes should be fenced in as what will be the contents of the data segment.

Once again, it'll go easier on you if you just accept this for the time being.

Finally, right at the top of the program there is a two hundred and fifty six byte buffer reserved for the stack. This space gets assigned to be the processor's stack space when the handshaking code is run. It stores PUSHed and POPped registers and the return addresses of CALLs. Don't worry about it, either... it'll all make sense in time.

Finally, we get to the the workings of the program. This little gnome produces a single page directory listing by inhaling the disk tracks with the directory information on them into a buffer, DBUFF, and subsequently printing out each entry which represents a valid file name. It also computes the size of each file... rounded off to the nearest K... and expresses these in decimal.

In using the 8088 it's important to realize that absolutely everything of any importance on the system happens by throwing an interrupt. The system has two hundred and fifty six levels of interrupts, and they do, among other things, virtually all of the system dependant I/O. For example, interrupt 10H outputs a character in AL to the screen.

The system has two hundred and fifty six levels of interrupts...

AL is the accumulator. Actually, it's half of it. The full sixteen bit accumulator register is called AX, which divides into AL and AH. There is also BX, CX and DX, all of which can be used either as sixteen bit registers or two eight bit deals. There are a number of other registers in the 8088... which we'll ignore for the moment. This program makes brief use of the SI register, but this is justs another sixteen bit variable in this case.

To keep things a bit less muddy, it might be worth noting that an eight bit register holds numbers from zero to 255. A sixteen bit register holds numbers from zero to sixty four K as two eight bit numbers, the first, the "L" part, being the ones and the other, the "H", the number of 256s there are in the sixteen bit number. To look at this another way, if you store a number in a sixteen bit register, the number divided by 256 is in the "H" part and the remainder in the "L".

Returning from this digression we find the program anxiously awaiting a good run. Since this thing is almost all subroutines, lets look at what the bits do.

The simplest routine is called PRINT. It prints a string to the screen. The location of the first byte of the string is stored in BX, the length in CX and, when you do a CALL PRINT the string shows up on the screen.

This program uses a trick to make the assembler calculate the length of the string. If you have a string expressed for the assembler as a string of bytes with a label, the length of the string will be equal to the location of the next label along minus that of the string's label. Thus, this loads CX with the length automatically...

```
LABEL    DB   'Electric wombats'
LABELX   DB   '$'  ;THIS IS A DUMMY
LABEL
```

and then

```
    MOV  CX,LABELX-LABEL
```

The PRINT routine is a pretty good example of a subroutine. As is the case of all small routines, it starts off with the declaration PROC NEAR... it's a near procedure, meaning that the 8088 can use short jumps within it. Just take this on faith. It also ends with a declaration, ENDP, for the end of the procedure. It's a bit like PASCAL in this respect.

The 8088 uses MOVs, data movement instructions, to handle a lot of stuff. MOV A,B means move B into A... things always move right to left. You can move between registers, parts of registers and between registers and memory locations. If you MOV with a register name you are referring to that register. If you use the name in square brackets you are referring to the memory location which is pointed to by the value in the register. Thus,

```
    MOV  AX,BX
```

puts whatever is in BX into AX.

```
    MOV  BX,0100H
    MOV  AX,[BX]
```

puts whatever is in location 0100H into AX.

The workings of PRINT are fairly easy to follow. The start of the string is in BX and the length is in CX. We get the first byte into AL, half the AX register and then set up for an interrupt call to print the character. Since BX is important we'll save it on the stack... PUSH it up and then get it back... POP it off... after the interrupt has returned.

The only tricky thing is LOOP. This is a very useful structure very much like a FOR NEXT loop in BASIC. It uses the CX register as a counter. If you encounter a LOOP instruction it will decrement CX and, if CX is greater than zero jump to the location in the label after the LOOP instruction. Otherwise the program will pass though on to the next instruction.

The interrupts used in 8088 programs may seem a bit weird if you have had some experience with other processors. Eight bit deals tend to treat the interrupts as a system transparent hardware thing. It's best to think of them in this context simply as function calls. There are interrupts to read the keyboard, write to the disk, bleep the speaker... a programming manual will provide you with a complete list of the system interrupts on the PC and what registers to set up prior to firing off an interrupt.

The other thing which uses an interrupt in this program is GETTRAX, the subroutine which gets the disk directory data into the memory buffer. It's a pretty straight up deal... you set up the registers of interest to tell the system what tracks you want and where you want to put 'em. Then... like cheap fake magic... they just show up.

The disk data is organized in a fairly useful manner. There are sixty four possible directory entries on a floppy disk. Each entry takes up thirty two bytes in the buffer. If the first byte of an entry is an "e" the file is inactive and the entry can be ignored... it's available for over-writing at the system's earliest convenience. Furthermore, twenty nine bytes into the buffer there is a sixteen bit number which represents the size of the file. Actually, this value uses more locations than this... the file size is maintained right down to the ones... but, since we only want to know how many K a file takes up we can use this value without having to hassle over multiple register math.

If you put this value in AX you have the number of two hundred and fifty six byte blocks there are in the file. Divide this by four and you know the number of K. While there is a built in division instruction in the 8088's instruction set... it's used in the decimal converter routine... it's a lot easier to divide by four by simply doing an arithmetic bit shift right two places. In this case, we want to know the status of the second shifted bit, as this determines whether the value in the accumulator should be rounded up or down, so it's handled as two single bit shifts.

It would have been less involved to have masked off the low bit and done a two bit shift but this looks a bit easier to understand.

The decimal converter is very simple... it just divides by ten five times and adds an ASCII offset to the result. Each character is stashed in the decimal conversion buffer, DECBUFF, which is then treated like a string by PRINT.

The line in DECON which converts the binary value in DX to an ASCII number, ADD DX,'0', works by adding the value of the ASCII zero character to the binary number.

The SHOWDIR, routine simply prints the first eleven characters... the file names... of each thirty two byte block which doesn't start with "e". There are sixty four possible ones. In fact, the first two are normally taken up by the system files. You can stop the program from showing you these by ADDing sixty four to BX just before the SDP: label and reducing the number of entries to sixty two.

No Blues, Charlie

Programming the IBM PC at the machine language level is surprisingly easy once you overcome the peculiarities of the environ-

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Assembler on the IBM

ment. The system is fairly well documented, and there are all sorts of things to tunnel into.

All you really need are a few disks, the appropriate bits of software from your MS-DOS master, an 8088 programmer's book and some time. Control-alternate-delete will get you out of practically anything...

And there are always those yarrow sticks if you really can't get your head around it.

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
;       DIRECTORY PROGRAM FOR THE
;       IBM PC
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;       STEVE RIMMER
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
;
STACK   SEGMENT PARA STACK 'STACK'
;THE LOCAL STACK GOES HERE
        DB      256     DUP (0)
STACK   ENDS
;
DATA    SEGMENT PARA PUBLIC 'DATA'
;
CR      EQU     13      ;CARRIAGE RETURN
LF      EQU     10      ;LINE FEED
;
HMESS   DB      CR,LF,LF
        DB      '                       IBM PC Directory
        DB      'Program Version 1.02',CR,LF,LF
HMESSX  DB      '$'
DERR    DB      CR,LF,LF
        DB      '                       Argh! The disk '
        DB      'is gorched...'
DERRX   DB      '$'
DBUFF   DB      2048 DUP(0)     ;DISK DIRECTORY BUFFER
DECBUFF DB      '     K ! '
DECX    DB      '$'
;
COUNT   DB      0
;
DATA    ENDS
;
CODE    SEGMENT PARA PUBLIC 'CODE'
START   PROC    FAR
;
DRIVE   EQU     'A'     ;DRIVE TO GET DIRECTORY OF
SIDE    EQU     0       ;SIDE OF DISK
;
;THIS IS THE HANDSHAKING CODE FOR THE IBM
        ASSUME  CS:CODE
        PUSH    DS      ;SAVE PSP
        MOV     AX,0
        PUSH    AX      ;SAVE RETURN ADDRESS OFFSET
        MOV     AX,DATA
        MOV     ES,AX   ;EXTRA SEGEMNT ADDRESSING
        ASSUME  ES:DATA
        MOV     DS,AX   ;DATA SEGMENT ADDRESSING
        ASSUME  DS:DATA
;THE DIRECTORY PROGRAM STARTS HERE...
        MOV     BX,OFFSET HMESS ;POINT TO HELLO MESSAGE
        MOV     CX,HMESSX-HMESS ;GET LENGTH OF MESSAGE
        CALL    PRINT           ;PRINT IT
        CALL    GETTRAX         ;DISPLAY THE DIRECTORY
        RET                     ;BACK TO DOS
;
;   ...AND ENDS HERE
;
;       *** SUBROUTINES
;
SHOWDIR PROC    NEAR            ;PUT DIRECTORY ON SCREEN
        MOV     CX,64           ;64 POSSIBLE ENTRIES
        MOV     BX,OFFSET DBUFF ;POINT TO DIRECTORY BUFFER
SDP:    PUSH    CX              ;SAVE COUNTER
        MOV     CX,11           ;ELEVEN CHARACTERS IN A FILE NAME
        MOV     AL,[BX]         ;IS THE FIRST BYTE AN E5?
        CMP     AL,0E5H         ;IF YES, IT'S EMPTY
        JZ      SDN             ;GET NEXT ONE
        PUSH    BX              ;SAVE POINTER
        CALL    PRINT           ;PRINT NAME
        POP     BX
        PUSH    BX              ;GET POINTER BACK
        CALL    DECON           ;SHOW SIZE IN DECIMAL
        POP     BX              ;BUMP POINTER TO NEXT ENTRY
SDN:    ADD     BX,0020H        ;POINT TO NEXT ENTRY IN BUFFER
        POP     CX              ;GET COUNTER BACK
        LOOP    SDP             ;LOOP 'TIL DONE
        RET
SHOWDIR ENDP
;
PRINT   PROC    NEAR
        MOV     AL,[BX]         ;GET CHARACTER IN AL
        PUSH    BX              ;SAVE POINTER
        MOV     BX,0            ;SET UP FOR
        MOV     AH,14           ; ...INTERRUPT TO
        INT     10H             ; ...PRINT CHARACTER
        POP     BX              ;GET POINTER BACK
        INC     BX              ;POINT TO NEXT CHARACTER
        LOOP    PRINT           ;LOOP 'TIL DONE
        RET
PRINT   ENDP
;
DECON   PROC    NEAR
        ADD     BX,29           ;POINT TO FILE SIZE
        MOV     AX,[BX]         ;GET IT IN AX
        MOV     CL,1            ;DEVIDE BY TWO...
        SHR     AX,CL
        MOV     CL,1            ;AND DEVIDE AGAIN
        CLC                     ;CLEAR CARRY
        SHR     AX,CL           ; ... TO GET K
        JNC     NORND           ;SEE IF ROUND NEEDED
        INC     AX
NORND:  MOV     BX,OFFSET DECBUFF       ;POINT TO DEBUFF
```

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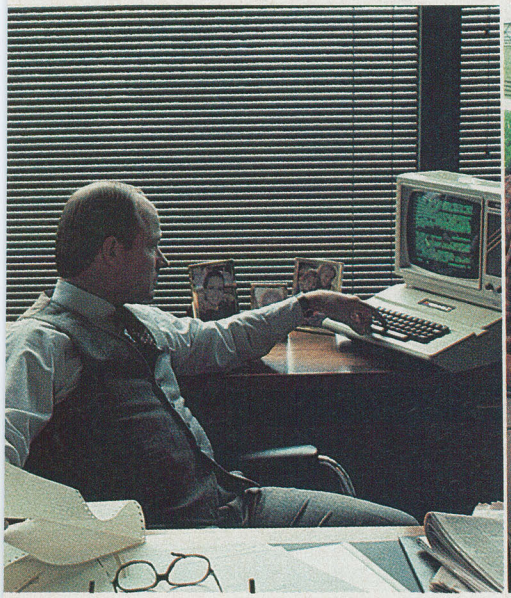
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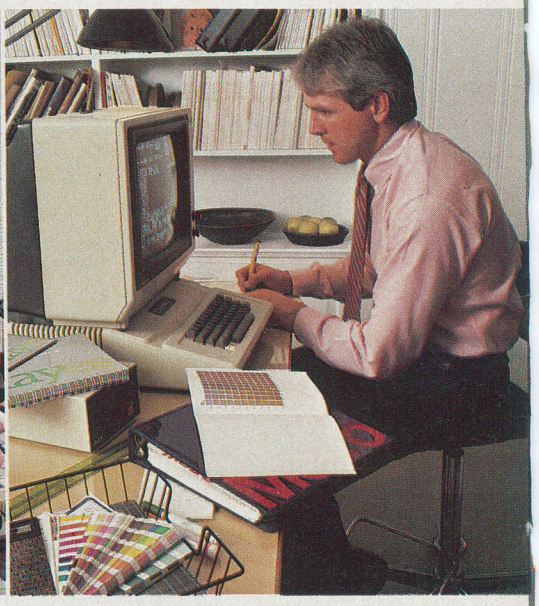
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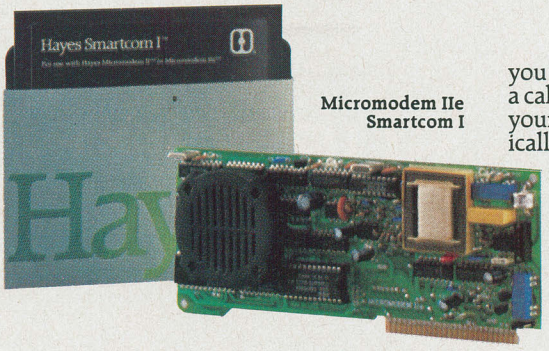
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Assembler on the IBM

```
        MOV     CX,5            ;FIVE SPACES
FLUSH:  MOV     BYTE PTR [BX],' '       ;POINT TO DECBUFF
        INC     BX              ;FILL WITH SPACES
        LOOP    FLUSH
        MOV     SI,10           ;SOMETHING TO DEVIDE BY
DIVD:   SUB     DX,DX           ;CLEAR TOP OF DIVIDEND
        DIV     SI              ;DEVIDE
        ADD     DX,'0'          ;MAKE IT ASCII
        DEC     BX              ;BUMP POINTER
        MOV     [BX],DL         ;STASH DIGIT
        INC     CX              ;BUMP COUNTER
        OR      AX,AX           ;DONE?
        JNZ     DIVD            ;GO AGAIN
;
        MOV     BX,OFFSET DECBUFF
        MOV     CX,9
        CALL    PRINT           ;SHOW SIZE
        RET
DECON   ENDP
;
GETTRAX PROC    NEAR
        MOV     CX,5            ;FIVE TRIES 'TIL ERROR
ATTMPT: PUSH    CX
        MOV     BX,OFFSET DBUFF ;READ DISK DATA INTO BUFFER
        MOV     DL,DRIVE-'A'    ;POINT TO DRIVE TO DIR
        MOV     DH,SIDE         ;SIDE OF DISK
        MOV     CL,4            ;START WITH SECTOR 4
        MOV     CH,0            ;OF TRACK 0
        MOV     AL,4            ;READ FOR FOUR SECTORS
        MOV     AH,2            ;READING FUNCTION
        INT     13H             ;NOW GO FOR IT
        POP     CX              ;GET COUNTER
        JNC     GOODGET         ;EVERYTHING OK?
        MOV     AH,0            ;RESET DISK SYSTEM
        INT     13H
        LOOP    ATTMPT          ;TRY AGAIN

        MOV     BX,OFFSET DERR  ;POINT TO ERROR MESSAGE
        MOV     CX,DERRX-DERR   ;GET LENGTH
        CALL    PRINT           ;SHOW IT
        RET                     ;GET LOST
;
GOODGET:
        CALL    SHOWDIR         ;SHOW DIRECTORY
        RET                     ;GET LOST
;
GETTRAX ENDP
START   ENDP
CODE    ENDS
        END     START
;                                                       CN!
```

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CBM Printer Interfacing



Commodore printers are ... well, they're all right, but there are better, and cheaper ones available. Here's a look out how to interface to them.

by John McEwen

A printer for my 64! With a printer this "computer for the masses" can become a powerful wordprocessor, provide hardcopy from spreadsheets and database program and, best of all give the printed listings for programs. However owners of Commodore 64s and for that matter Vic-20s have a small problem. The only plug compatible printers currently available for these computers are the Vic Printer, the 1525 and its recent replacement, the MPS 801. Although reasonably priced at about three hundred dollars, these printers are slow and have inferior print quality, lacking descenders, that part of certain lower case letters that ought to descend below the type line. They also lack many of the features found in printers in their class, features which can raise the print quality from barely readable to almost letter quality.

What stands in the way ot a 64 owner who wants to use a superior printer? There are two basic problems. First, the 64's printer port is a serial device while the cheap but good printers have a Centronics parallel input. Although a serial input is often available as an expensive option, this RS 232 C input is not compatible with the Commodore port.

The second problem concerns the language that computers use to communicate with printers, ASCII. Each byte stands for a letter or control character. As with any communication, this works when both the computer and the printer attach the same meaning to a given number. Unfortunately, PETASCII, the Commodore version of ASCII is non standard in two respects. PETASCII contains graphic characters and control characters that are not found in the regular version of ASCII that a Gemini 10X or an Epson expects. Second, many of the standard alphanumeric and control characters are given different values in PETASCII than in ASCII.

If a non-Commodore printer is to be used with a Vic-20 or a 64 two things have to occur. The output from the computer has to be reconfigured so that the printer can receive it in the Centronics parallel format and the output language of the computer, PETASCII, must be translated into ASCII. This is not as involved as it seems. Users of earlier Com-

CBM Printer Interfacing

modore machines, PETs, 8032's and so on, have for many years used little boxes between their computers and printers. These devices are transparent to the software being run and work quite nicely. There are basically three ways of hooking up your 64 to a non-Commodore printer with price tags ranging from fifteen dollars to over two hundred dollars.

The Fifteen Dollar Solution

On the parallel user's port of the 64 there is an eight bit wide data port and some control lines. Two amphenol connectors, #530665-3 8040 (for the 64) and 57-30360 (for the printer) and a length of flat fourteen live ribbon cable will give you the cheapest interface. Pages 360 to 362 of the Commodore Programmer's Reference Guide give the specifications for the port and your printer manual will help with the other end. For Gemini 10X users, Appendix N of the new printer manual is the place to look. Of course you have to write or find the software to access the port and to convert from PETASCII to ASCII. This is recommended only for those who are long on ability and short on funds. Such devices are available assembled, often with software.

A second type of interface plugs into the serial port of the 64. The printer can then be accessed with the usual commands. These devices consist of serial to parallel converters and PETASCII to ASCII translators. In comparison with the above solution, their use is effortless. On the other hand the price is somewhat higher; at least a hundred dollars.

I have used an interface of this type, the Cardco Card/?+A for about four months to link my Vic 20 to a Gemini 10X. This interface offers a selection of listing modes; normal or graphics, each with or without linefeeds and with or without lowercase. Selection is made via the secondary address, x, in the open 4,4,x command.

In the listing mode cursor, color and screen characters are represented by a two letter sequence inside brackets. In the normal mode, the PETASCII to ASCII translation is made for the alphabetic characters but other character values are passed without change. In the graphics mode all character values are passed to the printer without change.

I've used this printer interface combination to print program listings, word processor files, bit mapped graphics and screen dumps.

G Men

Cardco now sells an improved version of this interface which will allow an Epson or Gemini or similar printer to completely emulate a Commodore printer including the printing of the PET graphic characters. The company has an upgrade policy whereby in exchange for your old model and some money, they will give you the new version, the Card/&+G.

The G version comes with the A manual with a few cryptic pages inserted to bring one up to date on the changes. A proper manual is promised if you send in the warranty card. This may be "the ultimate interface" as Cardco claims but without documentation finding out how it works is a cryptographist's trick.

There are several improvements over the A version in the new interface. Among these are a bug in the PRINT# statement that has been overcome and, in the listing mode all screen movement and color symbols are given as two to four characters inside brackets. There is also now provision for a hexadecimal dump from the computer and of course, PET Graphics.

The G uses two different techniques to make a Gemini print Commodore. If the character is part of the standard alphanumeric set, the interface simply sends the correct ASCII value to the printer. If a Commodore graphic character is encountered, the "G" puts the printer into the bit-mapped graphic mode and the character ROM in the interface is read for the appropriate pattern. Since the character in ROM consists of eight bytes giving the shape of the character from the top down, the print head makes eight passes to print a character. This slows the printer down somewhat. These characters are also wider than the standard printer ones, causing interesting effects when the two types are mixed on a line.

Secondary address six offers a fix of sorts. In that mode all of the characters are printed from the ROM. Then it looks just like a 1525 printer output right down to the missing decenders on g,j,p, and q.

Another interesting quirk in the interface is that in mode six you only get half of the Commodore graphic set. As users of Vics and 64s know, the Commodore keyboards can be set into either an upper case graphics mode where each character key can produce two graphics characters by pressing the Commodore or the Shift key at the same time as the character key, or the upper and lower case



mode where the shift key gives the upper case instead of the graphic character. Thus in the upper and lower case mode half of the graphics characters are unavailable. According to the documentation CHR$(145), when sent to the printer tells the interface to convert to the upper case, graphics mode. This instruction is ignored in mode six but works in mode seven.

I have another difficulty with the G upgrade. With the A version in the upper and lower case modes, only those PETASCII values required to get the upper and lower cases the right way around were translated. Almost all the other values were passed unchanged. This made it possible to use some of the multilingual and graphics characters found in the Gemini's character ROM. Now when those codes are accessed, I get the Commodore graphics instead. To mix these multilingual characters with upper and lower case text have to one would use mode three the graphic mode where all PETASCII values are passed to the printer without change and download a new character set into the printer's RAM. Although not difficult, this is a bother.

The Best Way

This article was written using an FX-80 printer hooked up to a 64 via a BusCard from Batteries Included. The BusCard plugs into the cartridge port of the 64 and is much more than a printer interface. It provides 4.0 Basic, a machine language monitor, an IEEE-488 parallel interface and a Centronics interface. All of these goodies boost the power of the 64 in a variety of ways, not the least of which is the ability to use big one and two megabyte floppy drives in stead of the 1541 drive. As a printer interface it is as good as the Cardco. It has no listing mode and no PET graphics however, it will give the combination of upper lower case and multilingual characters.

The Bus Card sells for about two hundred and fifty dollars. I have used one for about eight months now with few problems. When I want to use the PET graphic set, I download a new character set into the FX-80.

Class And Characters

There are a number of ways to interface and standard printer to a Commodore computer. The fifteen dollar solution will do the job for the least but you will have to work at it. The Card/&+G, for all my criticisms, offers a reasonably painless way of getting Epsons and their clones to render Commodore graphics. The BusCard from Batteries Included provides a powerful boost to the 64, and is quite useful if word processing, spreadsheets, databases and other business applications are what you have in mind. **CNI**

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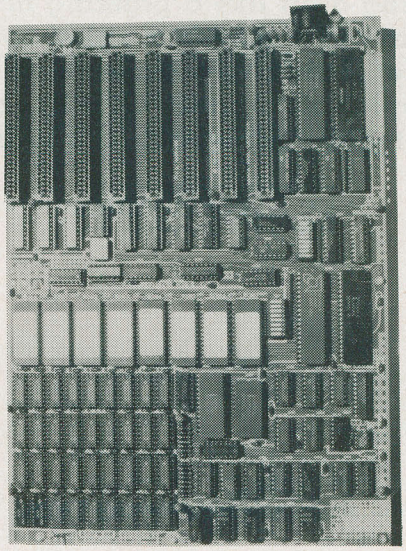
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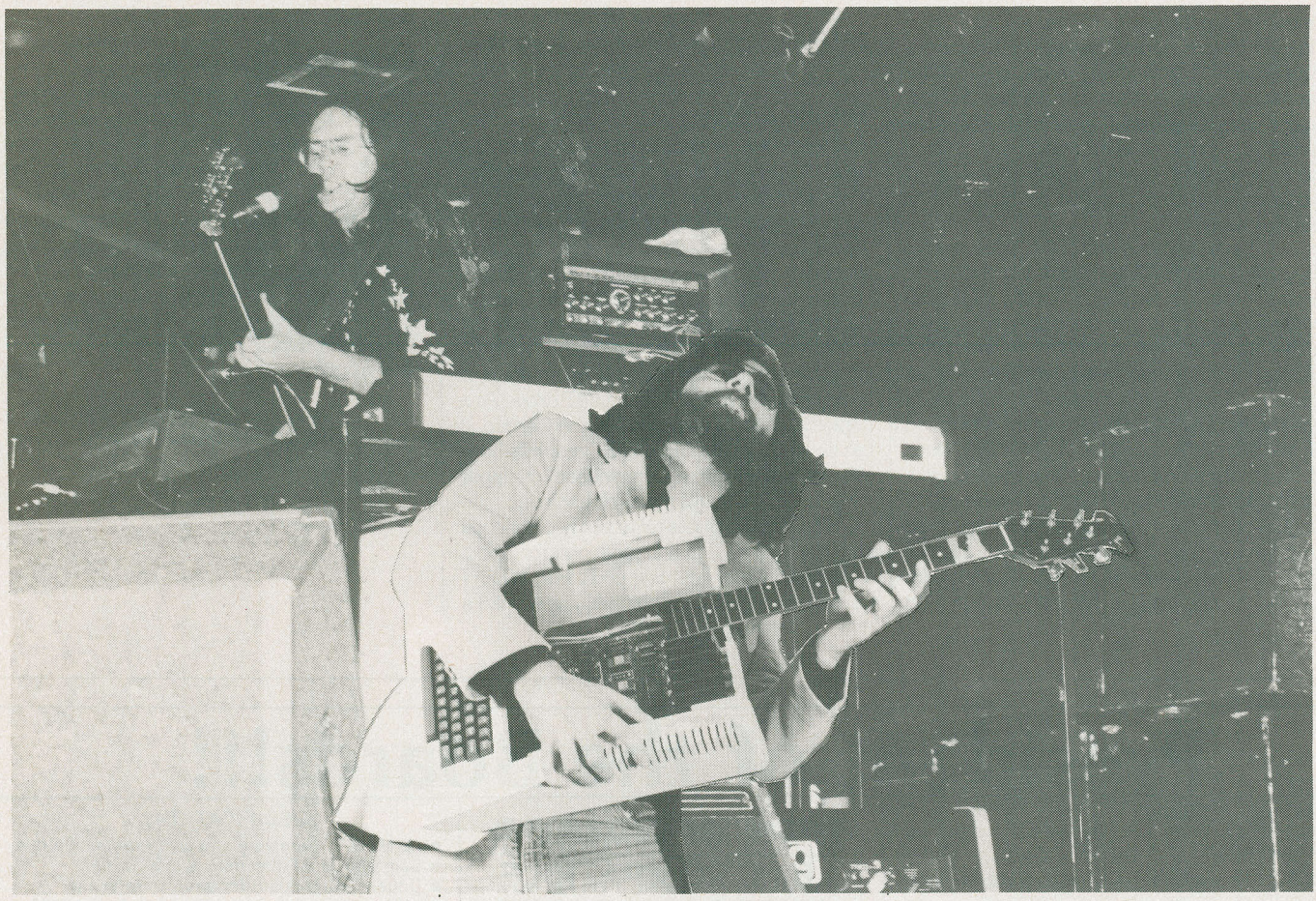
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Clef Hanger for the Apple



Sounding a bit like a banking machine preparing to dispense a roll of twenties, the Clef Hanger is a program to make the Apple sort of musical. If Bach were alive today, this would finish him off.

by Steve Rimmer

Most of the expensive music systems you can buy for the Apple come with moderately clever hardware and very well thought out software. The driving software in a good music package is very often considerably more involved than the silicon and fiberglass, comprising not only the code to translate computer numbers into sound but also a music editor... something to allow you to express yourself in somewhat human terms such that the computer can play what you dream up.

The normal form of a music editor is to have the machine draw a high resolution image of a staff and let the user plunk notes and other musical events down on it. If you think of this as a sheet of paper what you've really got happening is a sonic word processor. It sounds really esoteric.

Decent music boards costing what they do, we thought it might be interesting to play with a rather simpler music system. The Clef Hanger, presented here, is a complete monophonic music system for fruits of all species. It allows scores to be entered on a fairly realistic looking high resolution staff, edited with a cursor... moved about by the system's joystick... and stored on disk. It plays fairly well tempered music through the system's squeaker speaker.

The Clef Hanger is a very simple music box. However, written in Applesoft BASIC for the most part, it should be fairly easy to alter if you find you want to play more sophisticated stuff.

The Trouble With Trebles

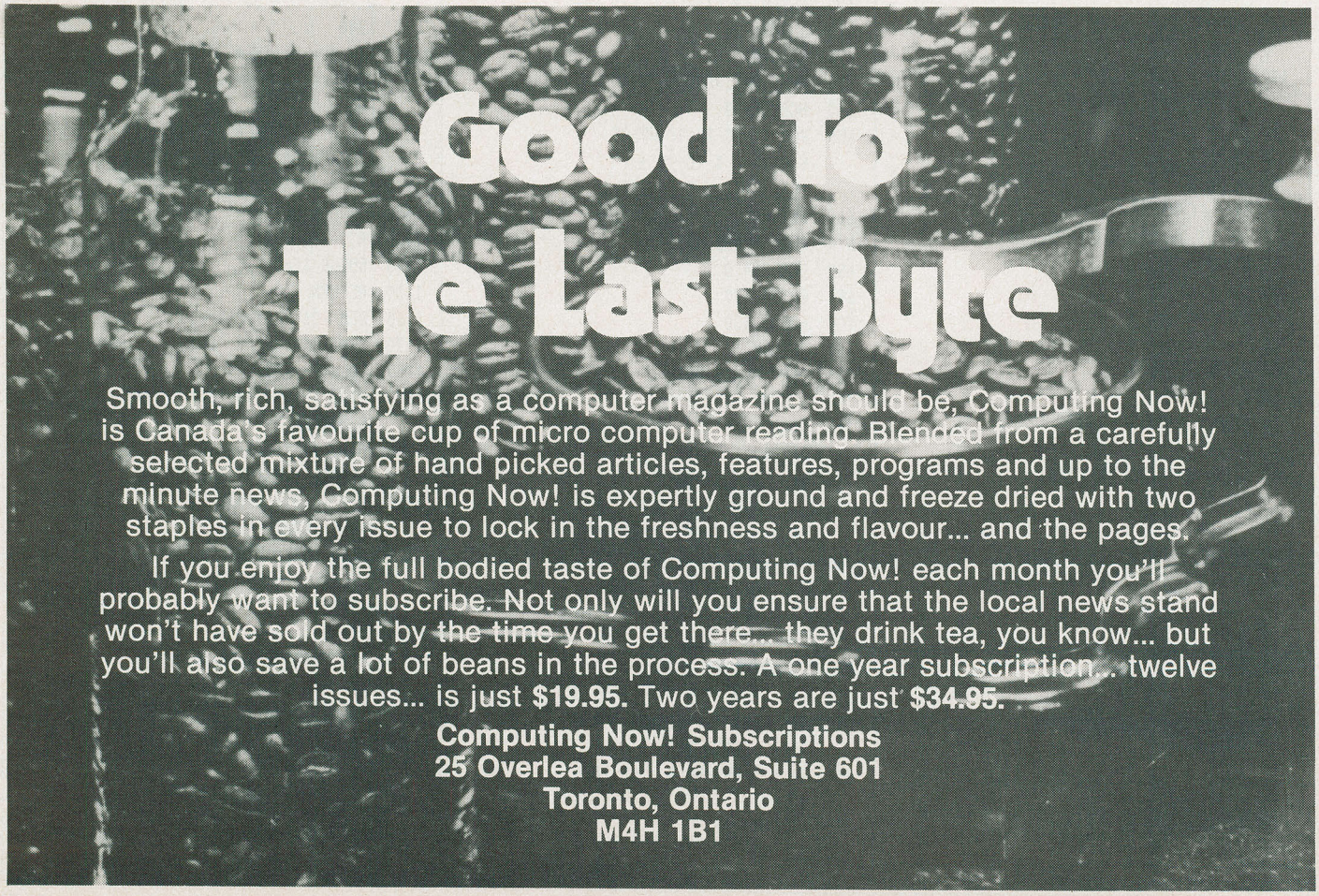
The editor is a bit tricky in that it has to move two phenomena... notes and a cursor... over an unchanging background, to wit, the staff. Because of the time it takes to draw the background the staff can't be refreshed every time something burps on the screen.

If the program draws a note on the staff and then discovers that some thoughtless human wants it moved it will have to turn off the pixels which make up the note... which will also leave some nasty gaping voids in the staff lines. The staff will very shortly begin to look like it's been wandering around Beirut between cease fires.

```
100  REM  ************************
110  REM  *    CLEF HANGER     *
120  REM  *    VERSION 3.4     *
130  REM  *  COPYRIGHT 1984    *
140  REM  *   STEVE RIMMER     *
150  REM  ************************
160  HGR : TEXT : HOME
170  HTAB (10): VTAB (10):
     INVERSE
180  PRINT "CLEF HANGER MUSIC
     BOX"
190  HTAB (10): PRINT "
     COPYRIGHT  1984   "
200  HTAB (10): PRINT "   STEVE
     RIMMER      "
210  NORMAL
220 D$ =  CHR$ (4)
230  PRINT D$:"BLOAD SCORE.PIC"
240 Q = 12
250 CS = 14
260 LM = 100
270 P = 23
280 T = 10:S = 20
290 N = 20
300  FOR X = 0 TO 9: READ F(X):
     NEXT X
310  DIM TUNE(12),SNG(255),
     FC(33),FD(33)
320  GOSUB 1980
330  GOSUB 2100
340  FOR X = 0 TO 255:SNG(X) =
     255: NEXT X
350  POKE  - 16304,0
360  POKE  - 16301,0
370  POKE  - 16297,0
380  FOR X = 0 TO Q:TUNE(X) =
     30: NEXT X
390  HOME
400  GOSUB 1160
410  GOSUB 760: GOTO 410
420  END
430  REM  DRAW NOTE
440  HPLOT (S + 5),(T + N - 3)
     TO (S + 8),(T + N - 3)
450  HPLOT (S + 3),(T + N - 2)
     TO (S + 9),(T + N - 2)
460  HPLOT (S + 2),(T + N - 1)
     TO (S + 9),(T + N - 1)
470  HPLOT (S + 1),(T + N) TO (S
     + 9),(T + N)
480  HPLOT (S + 1),(T + N + 1)
     TO (S + 8),(T + N + 1)
490  HPLOT (S + 1),(T + N + 2)
     TO (S + 7),(T + N + 1)
500  HPLOT (S + 2),(T + N + 3)
     TO (S + 5),(T + N + 3)
510  HPLOT (S + 1),(T + N + 3)
     TO (S + 1),(T + N + 20)
520  RETURN
530  REM  PLACE NOTE
540 S = 20 + (C * 20)
550 N = 3 + TUNE(C)
560  GOSUB 670
570  IF P > 128 THEN 620
580 N = 3 + P
590 TUNE(C) = P
600 SNG(PNT + C) = P
610  GOSUB 720
620  RETURN
630  REM  PATCH SCORE
640  HCOLOR= 3
650  FOR X = 0 TO 9: HPLOT
     S,F(X) + T TO (S +
     10),(F(X) + T): NEXT X
660  RETURN
670  REM  ERASE NOTE
680  HCOLOR= 0
690  GOSUB 430
700  GOSUB 630
710  RETURN
720  REM  PLACE NOTE
730  HCOLOR= 3
740  GOSUB 430
750  RETURN
760  REM  DO CURSOR
770 A =  PEEK ( - 16384) - 128:
     IF A > 0 THEN  GOSUB 1050
780 A =  PEEK ( - 16368)
790 J =  INT ( PDL (1) / 8)
800 M = (3 * J) + T
810 K =  INT ( PDL (0) / 20)
820 R = (20 * K) + 34
830 C = K:P = (3 * J) + T - 13
840  IF  PEEK ( - 16287) > 127
     THEN  GOSUB 530
850  IF M = LM AND R = LR THEN
     970
860  HCOLOR= 0
870 CS = LR
880 CV = LM: GOSUB 980
890  HCOLOR= 3
900 CS = R
910 CV = M: GOSUB 980
920 LM = M
930 LR = R
940  FOR Y = 1 TO 3
950 X =  PEEK ( - 16336)
960  NEXT Y
970  RETURN
980  REM  PRINT CURSOR
990  HPLOT CS,CV TO CS + 3,CV -
     2 TO CS + 3,CV + 2 TO CS,CV
1000  FOR X = 0 TO 9
1010  IF CV = F(X) + T THEN
     HCOLOR= 3: HPLOT CS,CV TO
     CS + 3,CV
1020  NEXT X
1030  RETURN
1040  DATA  21,27,33,39,45,
     57,63,69,75,81
1050  REM  HANDLE KEYBOARD
1060  IF A = 8 AND S6 > 0 THEN
     S6 = S6 - 1: GOSUB 1240
1070  IF A = 21 AND PNT < 255 -
     Q THEN S6 = S6 + 1: GOSUB
     1240
1080  IF A = 81 THEN  TEXT :
     HOME :A =  PEEK ( - 16368):
     END
1090  IF A = 70 THEN  GOSUB 1320
1100  IF A = 83 THEN  GOSUB 1570
1110  IF A = 76 THEN  GOSUB 1400
1120  IF A = 80 THEN  GOSUB 1760
1130 PNT = S6 * Q
1140  GOSUB 1160
1150  RETURN
1160  REM  DISPLAY STATUS
1170  HTAB (1): VTAB (20)
1180  CALL  - 958
1190  HTAB (2): VTAB (22): PRINT
     "SEGMENT: "
1200  HTAB (10): VTAB (22):
     INVERSE : PRINT S6: NORMAL
1210  HTAB (20): VTAB (22):
     PRINT "SPACE LEFT: "
1220  HTAB (32): VTAB (22):
     INVERSE : PRINT 255 - PNT:
     NORMAL
1230  RETURN
1240  REM  UPDATE CURRENT SCTR
1250 PNT = S6 * Q
1260  FOR Z = PNT TO (PNT + 12)
1270 P = SNG(Z)
1280 C = Z - PNT
1290  IF TUNE(C) <  > 255 THEN
     GOSUB 530
1300  NEXT Z
```

Clef Hanger for the Apple

```
1310  RETURN
1320  REM  DO SEGMENT FIND
1330 A =  PEEK ( - 16368)
1340  HTAB (2): VTAB (23)
1350  INPUT "FIND SEGMENT ":T$
1360  IF  VAL (T$) < 22 THEN S6
     =  VAL (T$)
1370  GOSUB 1240
1380  GOSUB 1160
1390  RETURN
1400  REM  DO DISK LOAD
1410  ONERR  GOTO 1690
1420 A =  PEEK ( - 16368)
1430  HTAB (2): VTAB (23)
1440  INPUT "FILE TO LOAD ":FL$
1450  IF  LEN (FL$) < 2 THEN
     1550
1460  PRINT D$:"OPEN " + FL$
1470  PRINT D$:"READ " + FL$
1480  FOR A = 0 TO 255
1490  INPUT SN6(A)
1500  NEXT A
1510  PRINT D$:"CLOSE"
1520  FOR A = 0 TO 9:TUNE(A) =
     SN6(A): NEXT A
1530 S6 = 0: GOSUB 1240
1540  GOSUB 1160
1550  POKE 216.0
1560  RETURN
1570  REM  DO DISK SAVE
1580 A =  PEEK ( - 16368)
1590  HTAB (2): VTAB (23)
1600  INPUT "FILE TO SAVE ":FL$
1610  IF  LEN (FL$) < 2 THEN
     1680
1620  PRINT D$:"OPEN " + FL$
1630  PRINT D$:"WRITE " + FL$
1640  FOR A = 0 TO 255
1650  PRINT SN6(A)
1660  NEXT A
1670  PRINT D$:"CLOSE"
1680  RETURN
1690  REM  ERROR TRAPPER
1700  HTAB (2): VTAB (23)
1710  INVERSE : PRINT "ARGH! AN
     ERROR! HIT ANY KEY": NORMAL
1720  GET A$
1730  GOSUB 1160
1740  POKE 216,0
1750  RESUME
1760  REM  PLAY THE TUNE
1770  HTAB (2): VTAB (23):
     INVERSE
1780  PRINT "PLAYING..."
1790  NORMAL
1800  FOR A = 0 TO 255
1810  IF SN6(A) <  > 255 THEN
     GOSUB 1850
1820  NEXT A
1830  GOSUB 1160
1840  RETURN
1850  REM  PLAY A NOTE
1860 PN = 32 - (SN6(A) / 3)
1870  POKE 252,FC(PN)
1880  POKE 253,FD(PN)
1890  POKE 254,1
1900  POKE 255,50
1910  CALL 768
1920  RETURN
1930  DATA  950,856,768,686,
     610,576
1940  DATA  514,458,408,384,
```

```
    342,304
1950  DATA  287.256,228,203,
    191,170
1960  DATA  151.143,126,113,
    100,95
1970  DATA  84,75,71,63,56,
    50,47,42,40
1980  REM  SET UP TABLE
1990  FOR X = 0 TO 32
2000  READ A
2010 FC(X) =  INT (A / 256) + 1
2020 FD(X) = A - 256 *  INT ((A
    + 1) / 256) + 1
2030  NEXT X
2040  RETURN
2050 A$ = " "
2060  DATA  169,0,166,253,164,
    252,105,1
2070  DATA  208,8,198,255,208,
    4,198,254
2080  DATA  240,12,202,208,
    241,136,208,238
2090  DATA  44,48,192,76,
    2,3,96,0,0
2100  REM  SOUND DRIVER
2110  FOR X = 768 TO 799
2120  READ A
2130  POKE X,A
2140  NEXT X
2150  RETURN
```

This can, of course, be gotten around. In this editor placing a note on the staff involves plotting the old position of the note over in black... erasing it... drawing in a short slab of staff over where it was and then plotting in the new note in white.

It would, of course, be simpler to draw in a new slab of staff with white and black lines to erase the old note, but this takes ages in Applesoft. High resolution plotting is, not surprisingly, one of Applesoft's slowest activities.

The editor can hold up to two hundred and fifty five notes. It keeps them in the array SNG(X), where X is the note in question. However, since it's rather difficult to get two hundred and fifty five notes on the screen at any one time while still being able to read them, this array is subdivided into twenty-two twelve note blocks called segments. The editor can display one segment at a time.

The editor comes up showing you segment zero. The cursor is a small triangle which will be somewhere on the screen depending upon the state of the paddles. It works in much the same way as the notes do, patching up any holes in the staff as it goes. When you move the paddles the cursor should tool around the staff and click.



If you hit button zero on the paddles the editor will heave a note where the cursor is pointing. You can there upon go and place other notes elsewhere on the staff. If you return to the same vertical area where you previously placed a note and hit button zero again the old note will be erased and a new one will show up where the cursor is pointing.

When you get segment zero full you can move on to segment one by hitting the right arrow key. Each new segment will show you the last note of the previous segment so you can remember where you left off. The left arrow key scrolls backwards along the staff.

If you want to move forward or backwards by more than one segment at a time you can hit "F", for find, and the number of the segment you want to skip over to.

The program can load and save its tunes using L and S respectively. Each song occupies five sectors on the disk.

Hitting P will cause the tune in the editor at the moment to play through the speaker. Finally, Q quits the program.

There are, obviously, other functions



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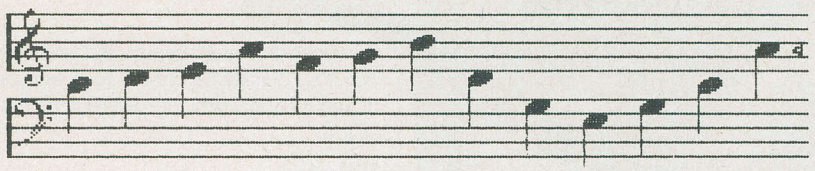
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Clef Hanger for the Apple



The screen . . . along with some notes, should look like this. The cursor is at the end.

which can be added to the manipulative aspects of the editor. Useful features would include insertion and deletion of events, block moves and single stepping through a passage. Dictates of space have entailed that these be omitted from this version of the program... you can add them if you get into it.

The system also works with some pretty basic musical principals. Because it doesn't have any means of representing sharps and flats everything is in the key of C. It also can only play half notes, and lacks any method of controlling the time signature. You can look at these shortcomings as either our way of keeping this one program from displacing the rest of the editorial in the issue or as an engrossing programming challenge.

In reality, the musical possibilities of the two inch speaker found in most fruits is limited, and attaching it to a driving program which can do sixty-four different musical events in full syncopation and a complete range of meters seems a bit like putting a Rolls Royce engine in a '57 Chevy pickup.

Let It Roll

Getting the Clef Hanger going involves a bit more programming than is usually required to do one function. There are, in fact, three separate phenomena which combine to make the thing happen. These are the editor, in Applesoft, the sound driver, in machine code and the staff background, in binary pixels.

The editor is shown here as program one. In amongst its miriad of data statements are the bytes that make up the sound driver. It can be typed in and saved. It won't be much good, however, until you get the other primary bit happening. The dismal thing about program two is that after taking a good half hour to type it in it needs only be run once. Thereafter the file it creates is used by the editor... and the program itself can languish on the inside tracks gathering dust.

Program two generates the high resolution page which displays the staff. It's a bit ginchy in its structure but it does work... and, like we said, it only gets used once. It will plot the two clefs from the co-ordinates in its DATA and draw in the staff lines. Then it BSAVEs the screen as SCORE.PIC and prepares itself for a life of relative inactivity.

This sort of thing is hard on programs. You see a lot of them wandering around downtown with bottles of cheap wine in their pockets disintegrating Datsuns just to cheer up a bit.

The file generator has a built in checksum. If you gorch the data it'll act annoyed and hit you with an error message.

Continuo

There's very little involved in using the Clef Hanger. It makes a decent introduction to computer music... or just a good way to get used to musical notation. It won't replace a two slot hardware orchestra but it's a trip to toodle on.

All together now...

Program 2

```
100  REM  ********************
110  REM  * CLEF HANGER SCORE
120  REM  * GENERATOR
130  REM  * COPYRIGHT (C) 1984
140  REM  * STEVE RIMMER
150  REM  ********************
160  FOR X = 0 TO 317:  READ B:A
     = A + B: NEXT X
170  IF A < > 12470 THEN  FLASH
     : PRINT "THERE'S AN ERROR
     IN THE DATA...": NORMAL :
     END
180  RESTORE
190  HGR
200  HCOLOR= 3
210  READ A,B
220   IF A = 999 OR B = 999 THEN
     GOTO 250
230  HPLOT B,A
240  GOTO 210
250  REM  DO LINES
260  FOR X = 0 TO 9
270  READ A
280 A = A + 10
290  HPLOT 0,A TO 279,A
300  NEXT X
310  REM  DO VERTICAL BARS
320  HPLOT 0,31 TO 0,55 TO  1,55
     TO 1,31
330   HPLOT 0,67 TO 0,91 TO 1,91
     TO 1,67
340    PRINT   CHR$   (4);"BSAVE
     SCORE.PIC, A$2000, L$2000"
350  END
360  DATA  162,3,45,3,46,3,
     47,3,48,3,50,3,70
370  DATA  3,71,3,72,3,86,
     4,44,4,45,4,46,4,47,4
380  DATA  48,4,50,4,51,4,
     52,4,69,4,72,4,74,5
390  DATA  42,5,44,5,45,5,
     53,5,68,5,72,5,74,5,84
400  DATA  6,32,6,33,6,34,6,
     35,6,36,6,41,6,42
410  DATA  6,44,6,47,6,48,6,
     54,6,58,6,59,6,60,6
420  DATA  68,6,84,7,30,7,
     32,7,38,7,39,7,40,7
430  DATA  41,7,42,7,46,7,
     47,7,50,7,54,7,57,7,58
440  DATA  7,59,7,61,7,68,7,
     83,8,29,8,30,8,39
450  DATA  8,40,8,41,8,42,8,
     44,8,45,8,46,8,54,8
460  DATA  57,8,58,8,59,8,
     61,8,68,8,81,8,82,9
470  DATA  30,9,38,9,39,9,
     40,9,45,9,46,9,47,9,48
480  DATA  9,54,9,61,9,68,
     9,69,9,80,9,81,10,32
490  DATA  0,36,10,38,10,39,
     10,45,10,46,10,50,10
500  DATA  51,10,54,10,61,10,
     69,10,70,10,71,10,78
510  DATA  10,80,11,33,11,34,
     11,35,11,36,11,45,11
520  DATA  46,11,52,11,53,11,
     54,11,60,11,70,11,71
530  DATA  11,72,11,74,11,75,
     11,76,11,77,11,78,12
540  DATA  45,12,46,12,53,12,
     56,12,57,12,58,12,59
550  DATA  12,72,12,74,12,75,
     12,76,12,77,13,46,13
560  DATA  47,13,52,14,47,14,
     48,14,50,14,51,14,70
570  DATA  14,71,14,75,14,76,15,
     70,15,71,15,75,15
580  DATA  176,28,999,999
590  DATA  21,27,33,39,45,57,63,
     69,75,81
```

CNI

SID Symphony



Colour and graphics capabilities are two major points people always flog when extolling the virtues of the Commodore 64. It seems that users are passing over one of the system's best features... it's capacity for producing sound.

by Leslie Wood

The Commodore 64 can produce music and sound which rivals even some dedicated music synthesizers — and it's all because of SID. If you aren't making music with SID, you're missing out on lots of fun, and you sure won't be named the Beethoven of the microcomputer era.

SID has three voices, which means that up to three tones can be played at the same time. Each voice is separately controlled by two factors: frequency and envelope.

The frequency of a voice is really just the pitch of the particular tone. And the envelope of a voice has nothing to do with Canada Post ... it determines how the volume of a voice rises, sustains and falls. It might sound a little bit technical, but that's only the jargon applied to what a sound actually does. Every sound you hear, all your life, will rise, sustain and fall. It's just that you're not used to hearing it described that way, or also that some sounds occur so quickly it's difficult to determine and distinguish between the different parts of the sound.

Volume

You may have noticed that the easiest way to define the changes in volume of a sound is by the length of time it takes to go from one volume to another. The orchestra may have taken two seconds to go from no volume to its maximum volume, and five seconds to fade away to nothing. The piano note took no time at all to reach its maximum volume, and maybe only a second to be gone again. And then there's the train, which might take thirty seconds to build up to maximum volume, and any length of time to fade away, depending on the length of the train.

Actually, the way the volume of a voice behaves is defined in four parts: Attack, Decay, Sustain and Release.

Attack is the time it takes for a sound to go from silence to the maximum volume SID is set at. Decay is the length of time taken for a sound to go from its maximum volume to a given mid-point or sustained level of volume. This is the part of a sound we most often don't realize we hear.

Sustain is not a time value at all, but a level of volume the sound maintains after the attack and decay. And a note will sustain forever unless you set the release, which is the time taken for a note to go from the sustained volume back to silence.

To actually make a noise on the Commodore 64, we must tell SID four things. The first thing is what the maximum overall volume will be. Secondly, we must tell SID to set the envelope of the voice we wish to use by defining the attack, decay, sustained level of volume and the release. The third thing to tell SID is to set the frequency of the voice to the desired pitch, and the last thing to do is tell SID what type of sound to play.

To give SID all the information it needs to do these things, all we have to do is put numbers into SID's memory. We put numbers into memories with the BASIC command POKE, and the numbers are the address (where the memory is to start) and the specific number to define what SID is to do. All the numbers needed to make sounds are listed in the Commodore 64 User's Guide.

Waveforms

Just before that slight degression we were looking at the things we must define for SID in order to produce a sound, the last one being the type of sound we want SID to make. The

type of sound is also called the waveform. When it comes right down to it, a waveform is a cyclical pattern in which air is being compressed and stretched. Because that's all sound is, really, the compression and stretching of air. The volume and type of sound depend on the speed and the pattern of the compression and stretching.

There are four waveforms or types of sound to choose from when making music with SID. See Figure 1 for examples. The triangular waveform produces a mellow, soft flute-like sound which is very pleasant to the ear because of the smoothness of the cycle. On the other side of the fence is what's called a sawtooth waveform. Because of its abrupt ending it produces a brighter, brassier sound.

The third waveform is called a variable width pulse, and can come in any variety of shapes and sizes. This is essentially an ON and OFF waveform, meaning that it is very abrupt and produces anything from a hollow, organ-like sound to a very quiet, reedy sound.

The last waveform has no definable image to be pictured here because it is a completely random waveform called noise. It has no defined harmonic qualities, but can be directed by altering its frequency to produce any sound from a hiss to a low rumble.

Memories Are Made of This

The seven memories of each voice are organized the same way. The first two memories control the frequency or pitch of the voice... which makes sense because when you set the frequency, you must put in a value for high frequency and another value for low frequency.

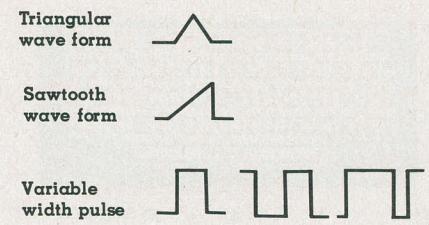
Memory three and four of each voice are for the variable width pulse waveform we talked about earlier. Because it is variable, its dimensions must be set and these two memories are used for this purpose. If this waveform is not in use, the two memories are left blank.

The fifth memory in each voice is the controlling memory, covering when to start and stop a a note and which of the remaining waveforms or types of sound are to be used. The sixth memory controls the duration of the Attack/Decay, and the seventh controls the Sustain level and Release time.

By using SID to its full potential, you can have a wonderful time creating music... either harmonic or dissonant. You can compose your own song using the sounds of one instrument or many, or program old favourites into the system to entertain you again and again.

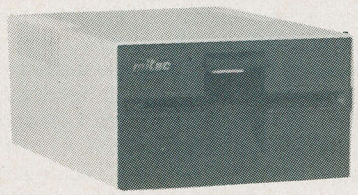
We've only touched the surface of the musical capabilities of the Commodore 64, but understanding something about SID really makes creating sounds a little bit easier and more fun. Now that you're more friendly with SID, you can spend your time making beautiful music together. **CN!**

Figure 1



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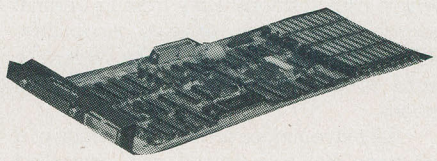


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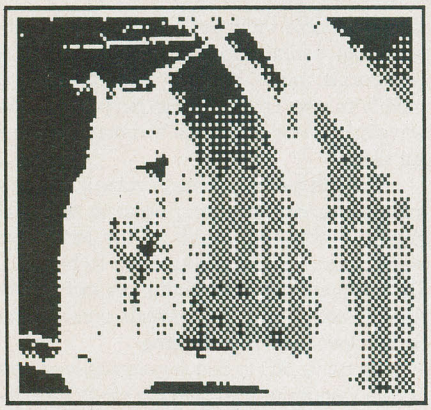
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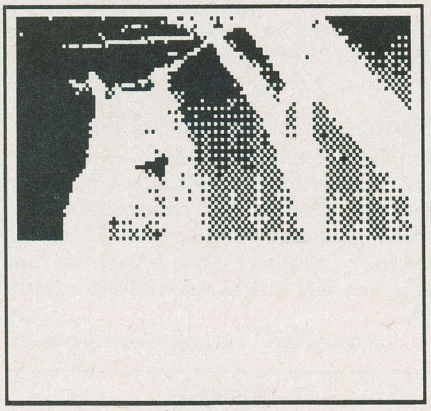
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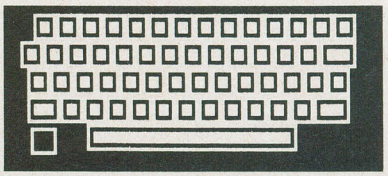
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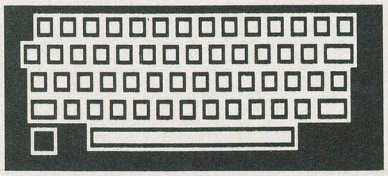
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DFX Review









You say that text files take too long to transfer? That you're tired of translating Applesoft, Integer and binary files to text? That you've got a lot of time on your hands during transfers? You need DFX II... and a banjo.

by John Rudzinski

File transfers are tricky things... phone lines are even trickier, and, as such, one has to be careful when selecting a program that will both transfer files from one computer to another and transfer them intact. CP/M users enjoy variants of MODEM7, which employs an intricate checksum method of transferring. Apple users without a softcard, however, are left with few choices.

Standard transfer exchanges between Hayes Micromodem or Apple-Cat users usually entail the sending and reception of text files which are saved first to a buffer, then to disk and then EXECed into memory, debugged to remove phone line contributions and finally saved again to disk under their original configuration. As this procedure is anything but fascinating, it is usually attempted only when the transfer is a dire neccessity.

DFX II from Alpha Logic Business Systems ...its stock car initials actually stand for "DOS File Exchange" ...largely removes the pain of file transferring with a number of integrated features originally inherent in DFX I, as well as a few new ones that will make it an invaluable possession for telecommunicating business users. This version, like its predecessor, was written by Graeme Scott of Kanata, Ontario.

Features in both DFX versions include sending and receiving any DOS file as is, two way "chat" while the transferring process is in action and the ability for both parties to view high resolution screens simultaneously during transfer.

Quick Reflexes

Where DFX II stands away from its original version is in its new *reflexive* capabilities. DFX II will support VisiCalc, Pie Writer ...a word processor ...and DOS in reflexive modes.

Reflexive modes are mirror images of a program that are viewed and controlled from both sides of the telephone line. In reflexive VisiCalc, both parties can manipulate the same spreadsheet. While one user is typing data into different fields, the other can see exactly what that user is entering... and add data where necessary. Naturally, this assumes that both parties have VisiCalc in their disk drives after the DFX II connection has been made and the appropriate driver has been downloaded.

The innovation in all this lies in its ramifications. Branch offices can view each others' profits and losses. When the SAVE command is entered through reflexive VisiCalc, the sheet is saved at both ends for later perusal. Long distance rates are expensive these days...

Pulling Through

Oddly, both users don't have to own DFX II to take advantage of its capabilities. The program is supplied with a "pull through" utility that the owner may enable to send a slave copy of DFX II whistling down the wires. The recipient need only have DOS in RAM and type IN#2 to get the ball rolling. This process, if all goes well, takes eight minutes. During that time, a counter decrements with a passion on screen. If the counter stops for any reason, the transfer has failed and has to be started over. This happened the first time I attempted it, but all went smoothly the second time.

After the counter has timed out, one user usually bids for *master*, the controller of the proceedings. If either the transfer came over with glitches or the other user has the same intentions in mind, NOT ACCEPTED BY REMOTE gets printed on your CRT.

The Great ESCape

There are three screens users can alternate between during file transfers. Accessed with the ESCape key, they are the menu, utility and graphics screens.

The graphics screen will show either garbage during normal data transmission or a high resolution picture if one is being transferred. For thirty-four sector files, these fly by fairly fast at three hundred baud... DFX II compresses sequences of bytes that repeat more than three times then expands them on the receiving end. This lessens transfer time considerably.

The menu screen gives you the options described above a bit, and is also the resting place of either your catalog or your associate's. File selections are made by the master by cursoring through the displayed catalog with the proper control keys and hitting control P to make a choice. A control C after the files have been identified begins the transfer. An interesting feature is a software clock that accurately determines how long a given file will take to go over the line. It increments with each file added and is an accurate indicator after transfers have been initiated as to how long you have to watch the late night Czechoslovakian cartoons before regaining control of your phone line.

Perhaps the busiest screen, and most confusing at first, is the utility screen. An inverse bar at the top of the CRT has five counters going mad at the same time during a transfer. These show *packed* or compressed bytes... those saved because of data compression, received characters, acknowledged characters in blocks, negatively acknowledged blocks... those that had to be sent again, and transmitted characters from your Apple. To the right of the transmitted and received counters is the two way data stream. This is a gas to look at,

though a bit of a strain when you find yourself trying to read any text flying by in it.

300 Baud Gossip

While entranced by the data stream, you won't find yourself missing out on any revelations that your partner has come up with. The chat feature is available on all screens, and is a welcome relief from the tedium of three hundred baud file transfers. On the utility screen, chat characters can be seen both on the text page not occupied by the inverse bar and in the two way data stream.

This is true when a file is being sent or received as well. All chat characters in the data streams are preceded with the hexadecimal byte FE, which shows on the Apple screen as a tilde character. These are separated from the buffer before being saved to disk.

During disk operations, the user whose disk is being operated upon gets hit with a KEYBOARD INACTIVE DURING DISK I/O message. The disk accesses are brief, and are hardly an inconvenience. Characters typed by the other user are stored in a buffer during these accesses, and then spray out to beat the band after the drive LED extinguishes. This is quite the sight the first time you see it.

Road Map Orbs

DFX II runs on an Apple][, //e or gross similarity with one or two drives and either a Hayes Micromodem or Apple-Cat modem ...or a compatible of either. It also requires a bit of control. After you've sent or received the files you'd originally intended, you'll likely find your arms flailing around your desk in search of more stuff to transfer. Once you're familiarized with the commands, your loved ones may never be able to tear you away from the phone.

I tested DFX II by selecting a victim from my bulletin board and letting him in on the details. Both the pull through and a transfer failed once, but went flawlessly after I called him back. The operation went on for quite a bit after three in the morning... the next time I try it, I'm going to be sure the sun is in the sky before booting the program again.

DFX II is an open disk... that is to say, the program can be modified by the user for his or her particular needs. The source code of the reflexive DOS utility is also included as a text file, fully annotated, so it can be manipulated to run practically any program reflexively. Though the program is, apparently, copy protected, a backup copy is included in the purchase price. As an added incentive, Graeme has written a spectacularly animated demo that will give you an idea of what the program is capable of.

In summation, DFX II does all its twenty-six page manual says it does and does it with style. The only complaint I can muster at this point is that it won't boot on a Macintosh... even if you fold the disk in half.

DFX II is available from Alpha Logic Business Systems, Inc., 4119 North Union Road, Woodstock, Illinois 60098. Registered DFX I users are entitled to a free upgrade, but should enclose three dollars with their old version for postage costs. **CN!**

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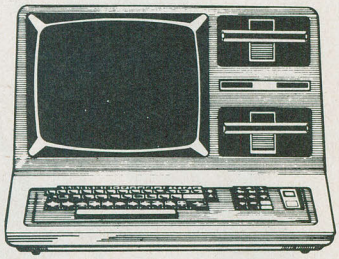
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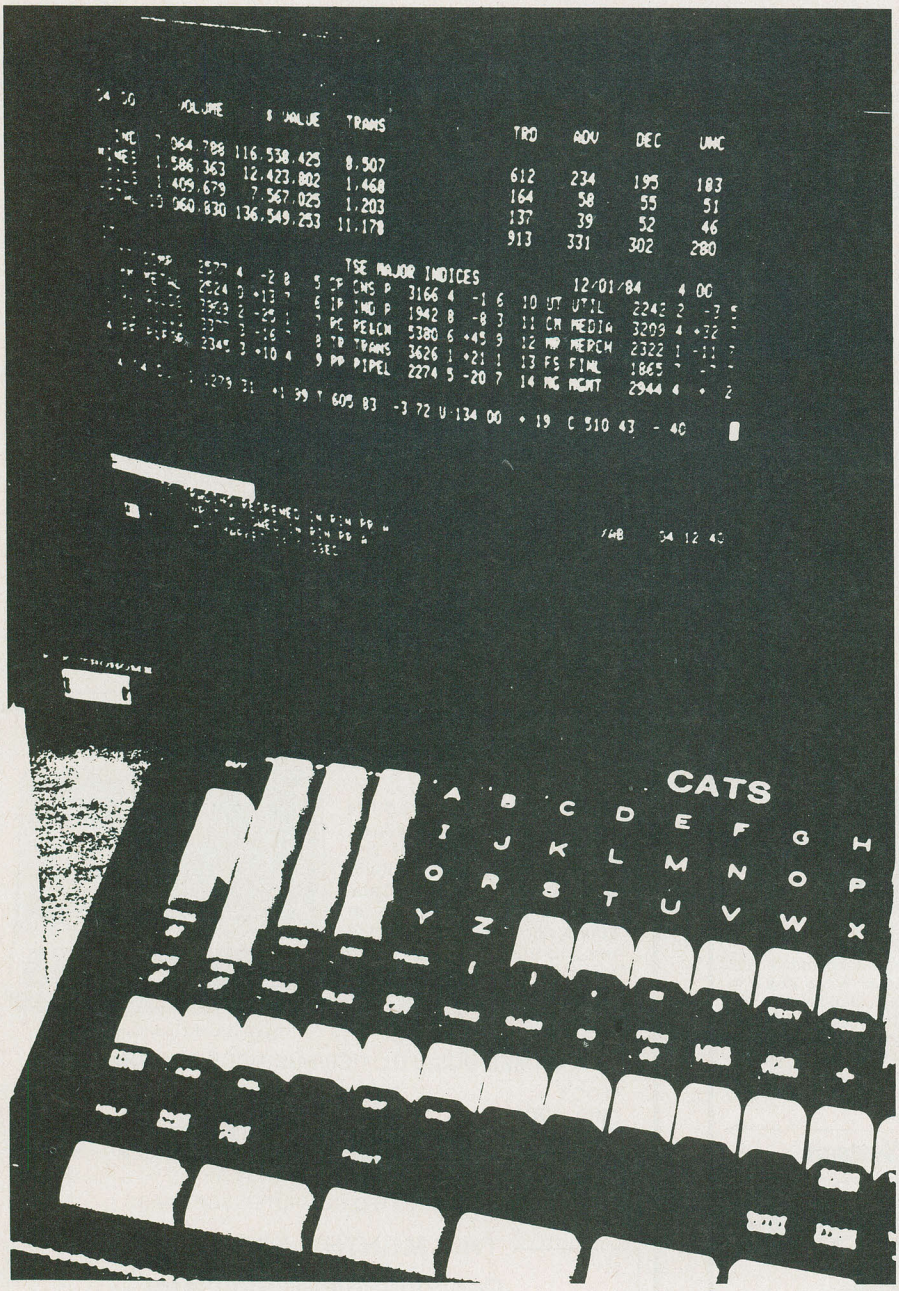
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by Frank Lenk

Ever find yourself wondering what the Deutschmark will do three months from now... or what the volume of trading on the stock exchange will be in six months... Who's selling what, to whom, and for how much?

Pithy questions, these, and all have answers callibrated directly in greenbacks.

Donald R. Unruh, vice president of operations at the Toronto stock exchange, is the man with the magic answers to these and other monetary mysteries. Just what he sees in his fiscal crystal is beyond mortal ken, but a brief look at the workings of the crystal itself is indeed a transcendental technological trip.

It is a fact all but unknown to those unaccustomed to dealing with dollars in more than two figure amounts that the Toronto stock exchange is one of the most advanced exchanges in the world as far as its use of computers goes. It is a further surprising fact that a great part of this computing power resides in micros rather than mainframes.

A visit to Unruh's sanctum in the TSE building reveals what is just the tip of the technological iceberg. Unruh's personal connection to computing is through a pair of IBM PCs, one residing at his residence, the other half buried in paperwork on his desk at the TSE. These systems are massively configured, with both ten megabyte hard disks and five megabyte hard cartridge drives. The home beastie also runs a 68000 processor board. These do the light housekeeping, as it were.

Zilogs and Mistresses

The real massive smarts reside elsewhere within the cavernous TSE building in two Zilog 8000 micro systems. Each of these little devils sports sixteen user ports and eighty megabyte Fujitsu hard disks with twenty millisecond access times. One of the two systems is used as a development unit while the other runs the day to day stuff. Both operate on Unix and are programmed chiefly in the C language.

These Zilog machines are used for several applications. So far, their biggest mission is to house the *Mistress* relational data base package. Mistress was developed in Toronto but is now licensed to Intel. The TSE has added a custom I/O interface to the original program.

Mistress, in turn, has two major functions. It... she... handles the Human Resources Information System (HRIS) and an Approved Person database. HRIS is unremarkable, being the TSE's internal personnel data file. The Approved Person database, on the other hand, is more than

moderately amazing, having much to do with what the TSE is and how well it functions.

In order to participate in the securities industry... apparently... one must become what is known as an *approved person*. This proviso applies not just to stock brokers as such, but also to many more esoteric functionaries. These individuals' particulars are stored in the database. About twenty six thousand people, to the tune of about fifty megabytes in all, reside there.

This database is administered by the TSE's department of member regulation under strict security. However, it is also made available to the investigative services group an organization composed largely of ex-RCMP members responsible for policing the industry.

The TSE is the only exchange to have automated its approval processing this way with the remarkable result that its turnaround on new registrations has been cut from around two months down to more like two days.

Forcasting and Networking

Still on their way are two other uses for the Zilog systems. One of these concerns the not entirely rhetorical questions posed at the start of this article and in fact the whole prickly problem of prognostication.

... one must become what is known as an approved person.

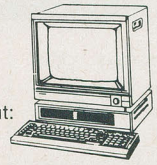
Does the name Box-Jenkins mean anything to you? To the computing cognoscenti, the name signifies one of the most powerful methods of statistical analysis. To the TSE it represents a tool which is no longer adequate.

The TSE has in fact been running its own analysis, some two to three generations ahead of Box-Jenkins, in order to predict trading volumes on both a three to four month and two to five year scale. Typical runs of the TSE package have consumed several hours of CPU time on a mainframe number chomper at IP Sharp. However, once a new compiler package arrives, the forecasts will be run in house on the Zilog units. A typical run will probably be overnight.

The effort is more than justified, according to Unruh. At a time when standard forecasting provided only monotonic curves, the TSE system correctly predicted the recent all time trading volume peak, foreshadowing the actual spiked curve with uncanny accuracy.

Apart from such massive and far end uses, the Zilog will eventually handle yet another task. With the entire TSE building originally wired to Ethernet standards, the Zilog could form the core of a unifying electronic mail system. This would tie together

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The Toronto Stock Exchange

not just all of the TSE offices, but could rope in the growing number of home terminals as well.

Other Hardware

Actually, the more mundane computing deserves mention as well. The TSE, like most other businesses, has caught a fair case of the big blue flu and broken out in a rash of IBM XTs and PCs. In fact, the IBMs have penetrated as private owner units more than as company machines. However, the TSE is gradually moving toward more use of the IBM as a single user productivity booster. Presently it has two PCs and one XT. A Hewlett Packard plotter together with Sign Master and Chart Master software are used to generate board room graphic presentations.

Not to be forgotten is a 'little' Onyx C-8000 unit, sitting out of the way on a shelf in the Zilog room. This eight port box, with a twenty megabyte hard disk, is almost entirely dedicated to internal accounting uses.

The most remarkable part of the TSE electronic empire remains to be examined. This is the unique CATS... Computer Assisted Trading System. Of all the issues handled through the TSE, only about one third... roughly four hundred and fifty...are actually traded on the exchange floor. These are the most active stocks, and are more than enough to keep things hopping. The other two thirds of the TSE stocks, generally less-active, are traded only through CATS.

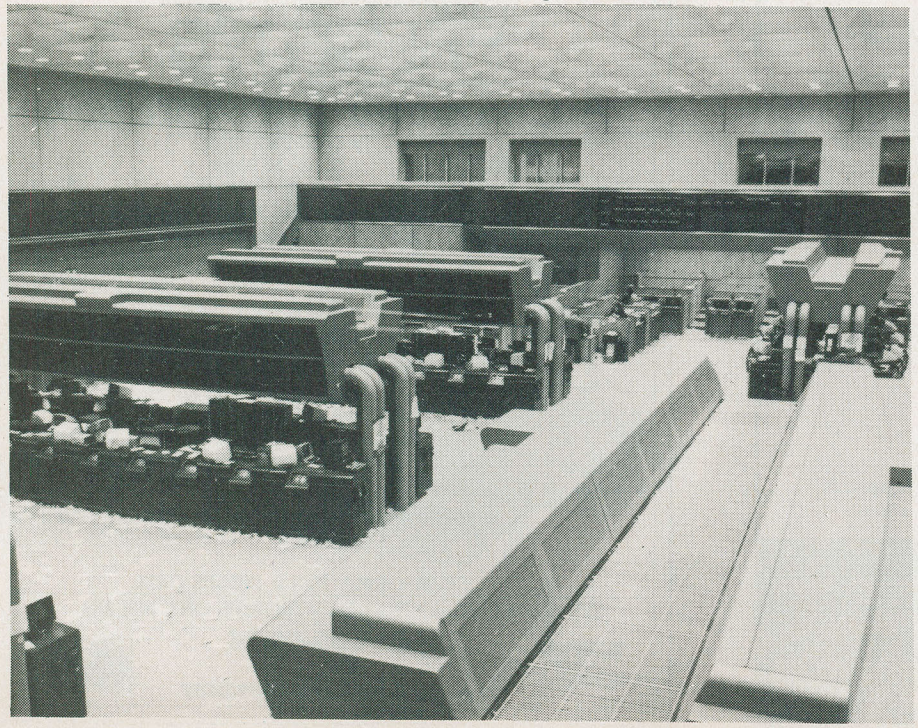


A CATS terminal

Originated in the early seventies, CATS has gone through several redesigns. It is presently based on a series of terminals custom designed by the TSE and TIL Systems and built in Mississauga by Logic/1. These run through an IBM 4341 mainframe. The system came up in late 1977, with terminals spread all over Canada.

Although CATS is certainly the most unique part of the trading system, it by no means exhausts the TSE's electronic repertoire. The trading floor itself is littered with over six hundred devices. More than half of these are passive displays, but at least a hundred and fifteen are touch screen inquiry terminals, hooked into two Tandem T-16 twenty four bit mini computers.

The floor of the Toronto stock exchange. Terminals abound.



Open House

If all of this machinery sounds a bit too high tech fear not. One last function of the Zilog system remains to bring some of this stuff down to earth.

The floor of the TSE is pretty well restricted to initiates of the world of higher finance. However, a visitors' gallery is thoughtfully provided. Here the footsore tourist may find relaxation in front of a public inquiry terminal, nestled in an alcove, surrounded by texts that help bring out the deeper meanings...

It talks to the plebs as well! **CN!**

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On the Cover:
Computers are moving into the offices of many small businesses all across Canada, and Radio Shack's Model 16 is proving to be a popular choice. The padded and chromed swivel chair on casters is pretty sharp, too.

First Published
March, 1984

Computers In Small Business

From Computing Now! Magazine







Should You Computerize?
If you are considering a computer for your business but still aren't certain whether one is necessary, this article is for you. Page **6.**

Buying a Business System
Suggestions on what you should look for in a business computer, and what you can reasonably expect one to do for your company. Page **10.**

Survey of Portable Computers
Portable computers have quickly become the businessman's friend; time that used to be wasted travelling or waiting for an appointment can now be put to good use. Here are the portables that are available in Canada. Page **15.**

Notes from Experience
This business computer purchaser learned a few lessons the hard way, and he's willing to share his conclusions with you. Page **22.**

Using a Portable Computer in Sales
There are quite a few interesting business applications for portable computers, but this is one of the best. Page **24.**

Profile: Micros in Print
How a TRS-80 Model III has changed the way Kerry Gibbens produces tabloids. Page **27.**

COBOL: What Is It?
A look at a computer programming language developed especially for the business environment. Page **30.**

Operating Systems Explained
A layman's approach to understanding the essence of a computer. Page **34.**

Digging Into CP/M
CP/M is the closest thing to a universal operating system that the world of computers has yet experienced. Here's a close look at how it works. Page **37.**

A Look at dBase
A database program that has received popular acclaim and which deserves to be carefully explored. Page **42.**

The Monthly Amortization Chart
An amortization program in BASIC to help you determine monthly interest and principle charges. We've even included line 1360. Page **46.**

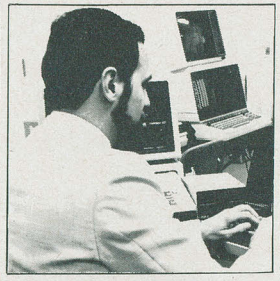
Micro to Mainframe
Communication with a mainframe computer can open your office micro to a whole new world of potential profits. Page **50.**

Profile: Specialty of the House
Restaurant owner Michael Rowlands used to carry a bag of lettuce to work. Now he totes an Osborne 1. Page **54.**

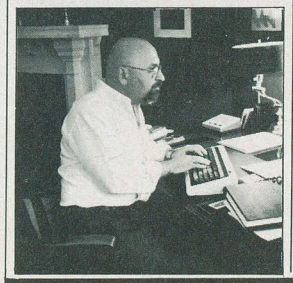
VisiCalc
The pioneering spreadsheet that offers considerable power for accounting and business forecasting. Page **56.**

Picking an Accounts Package
Accounting is a perfect task for the microcomputer. Here are some suggestions on how to choose software that you'll be happy with. Page **59.**

Profile: Micros in Construction
Peter Ferst hangs on to the fiscal reins of mega-dollar construction projects with his Televideo computer. Page **63.**







Lookup Tables
These tables add a whole new dimension to working with spreadsheets, and make some calculations simpler as well. Page **65.**

Bar Charts for Business
A BASIC program that allows the creation of customized bar charts. Page **68.**

Survey of Plotters
Trying to gather all of your employees around the computer to look at a bar chart on the screen can be more trouble than it's worth. Solve the problem neatly, and print it out with a plotter. Page **73.**

Introduction to Wordstar
A guide to one of the most popular word processing programs. How it works and what it does. Page **81.**

Buying a Business Printer
Choosing a printer is not a simple matter. This article points out the factors that you should take into consideration. Page **86.**

Computer Aided Drafting
These systems aren't financially feasible for every architect or designer, but in the right application they'll save both time and money. Page **90.**

Profile: A New Policy
In the rapidly changing insurance industry, Richard Segal's IBMpc is paying big dividends. Page **93.**

Bubble Sort
Written in machine code for TRS-80 computers, this program can handle up to 500 items at a dizzying pace. Page **95.**

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Converting the Heathen Program



Why is it that the most ingenious programs are invariably written for every computer on the planet except yours? Here's an alternative to crying on your keyboard.

by T. Gray

'What a fantastic program', you muse as you browse through the latest issue of Computing Now! magazine, '...but it's not written for my kind of computer.'

Should you buy the magazine and try to convert the program to run on your system? Of course you should buy the magazine! The decision to translate the listing, however, will depend on the answers to a number of other questions. Do you really want that program? Are you sure there is no similar program available already for your machine? Do you have the free time to work on a conversion? Do you want to learn a lot more about your own version of BASIC? If you've answered 'yes' to any of these questions, then you're on the road to conversion.

Is the listing several pages long? Does the program use high resolution graphics? Are there machine language commands or subroutines involved? Is the listing unclear, hard to follow, or scantily documented? If the answer to any of these questions is 'yes', think twice about converting. It could be a long, tough job.

Still, the effort of rewriting a program is productive. By converting a program, you can learn a lot about programming itself. You won't learn much by simply typing in a listing written for your computer; it goes in the eyes and out the fingers. Adapting a program to your own micro will clarify many concepts by helping, or even forcing you to understand how the program works. You will pick up some useful subroutines to apply to your own programs. You'll be forced to develop shortcuts and substitutions. You can even be creative, enhancing programs with the colours and sounds appropriate to your particular computer.

For your first conversion effort, try something short and simple. Lonnie Falk, the editor of a computer magazine called *RAINBOW*, points out that 'the more fancy a program, the more chance there will be some problems' in conversion. Try to avoid a listing with PEEK, POKE, POP, USR, or other machine language sections, but don't give up just because there are some.

Help!

Help can be found in many places. There are a number of books on the market that will simplify your task. *The BASIC Book*, by Harry Helm, *The BASIC Conversions Handbook*, by Brian and others, and *The BASIC Handbook* by Dr. D. Lein are all useful. These books list the equivalent commands for common microcomputers, and offer tips to help with conversions. See the end of this article for details. While your

An Invitation From The Editor of Electronics Today . . .

Electronics Today International keeps you up-to-date on high tech, as well as publishing projects and articles for the testbench fan.

The May issue, for instance, takes a look at Test Equipment: you'll find out about the latest lineup of products to simplify your designing, measuring and troubleshooting. There's a project that converts any modem to automatic answering, and Roger Allan reports on computerised weather forecasting. Computer fans will have a review of the Coleco Adam system.

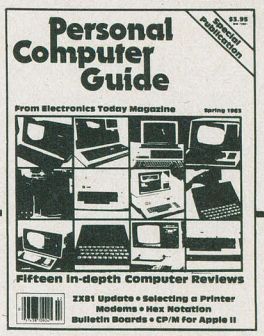
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Converting the Heathen Program

book order is in the mail, you can push on.

Computer magazines which cater to a variety of users often carry listings for several versions of BASIC. You can study these to see how other programmers have handled the conversions. One example is Softside magazine's 'Selections', a single program in parallel listings for Atari, TRS-80 Level II, Applesoft and IBM PC Advanced BASIC. Even if you don't use one of those dialects, the listings are so well documented that conversion is made simpler. Magazines will occasionally print tips for conversions, or programs translated from various sources.

Step by Step

Once you have located a suitable listing and are determined to convert the thing to the true path, you sit down and start typing. Nope. That may work, but it will be trial and syntax error every step of the way.

To start your conversion, sit down and think. If there isn't a chart of the program's variables, make one. Refer to it frequently. If it becomes necessary to rename variables, the chart will help you keep from getting lost. Come to think of it, a variable chart is helpful in any case, even for programs you write yourself.

A flowchart of the listing you plan to convert is almost essential. Flowcharting the listing will give you a good idea of the general structure of the program. Work by functional blocks, instead of line by line. This will make it much simpler to write code for your own machine. If you are stumped by a particular section of the listing, the flowchart will help you understand its purpose, and you can write your own code to do the same job.

Start Simple

Printing text is relatively simple, so let's discuss it first. If you just type in some text straight out of a listing, your computer will print it on the screen. It probably won't look pretty, though, and will be hard to read. Worse yet, the text may scroll out of sight before you have time to read it.

Obviously, as different computers have different screen sizes, they can have more or less text onscreen at a particular time. You can cope with this by using either more or fewer PRINT statements, and by inserting FOR/NEXT loops or similar pauses where necessary. It's easier to go from a VIC 20 or Color Computer's small screen to a larger display than the other way around. However, you can also condense, or even rewrite, for brevity. These are not insurmountable problems.

A little attention to the location charts in your manual will serve to straighten things out. You can centre titles, pad out blocks of text, and so on. Commands to print at specified screen locations are a bit tricky, but can be managed.

Get the Picture?

Graphics are a bit of a problem. "If you want to work on a graphic program," says Falk, "go ahead. But don't expect it to be easy, and plan to do a lot of rewriting from scratch." Still, your time's your own, right?

Low resolution graphics may be done with CHR$ or by plotting pixels. The documentation, either internal REMarks and subroutine titles, or a line by line analysis of the program will be most helpful here. If you can't get a clear impression, make an educated guess. A list of the CHR$ for the two BASICs involved is certainly a help, as is an acquaintance who knows the original language.

A flowchart of the listing you plan to convert is almost essential.

High resolution graphics and animation are things I try to avoid translating. Occasionally, though, I find it easy. "All that just to draw a smiling face on an Apple? Why, I can do that in one line!" Some machines, such as the IBMs and the if800, have BASICs similar to my Color Computer's, and are relatively easy to translate. You may find similarly convenient situations.

A PEEK at POKES

In *The BASIC Book*, Helms warns that programs with high resolution graphics and statements such as PEEK, POKE, CALL, POP, USR and the like will be "...difficult, if not impossible to convert." Falk is even more discouraging. "If it PEEKs or POKEs," he say, "forget it."

Don't, however, give up too easily. If the program you want to convert has only a few of these, you might still carry it off. Study the documentation and listing carefully to find the purpose of the command. Study your system's memory map. Call up a store or users group that handles the original system. You may be able to work something out.

Often, this kind of command is used for efficiency or speed. Your machine may be fast enough as it is, or you may have to put up with a slower program. For some purposes, this will be acceptable.

Substitute, Guess, and Cheat

Sometimes these machine language CALLs, and some M/L subroutines, involve sounds. You may be able to improvise using the built-in sound routines of your own system's ROM. It's worth a try.

Occasionally, you can substitute. To give one small example, some BASICs have no exponential fuction. For small positive exponents you can multiply...x3=x * x * x... but would you want to do that for x15? There may be a lengthy subroutine in the manual to do the job, but for simple positive exponents, like x to the y, you can substitute this:

```
K=1:FOR T=1 TO Y:K=K*X:NEXT T
```

Watch for shortcuts and enhancements. It's quite possible that your system has sound and graphics capabilities far beyond those called for by the program you are converting. You may find a way to replace whole sections of code with a few lines.

At the very worst, in utter desperation, try omitting a problem section. Leave it out completely!

To Sum Up

Converting programs is a lot of work, but can be worth the effort. The amount of effort involved will depend on the program to be converted and on your own programming skills.

Look for short, simple programs. Avoid HiRes graphics.

Make a list of variables and a flowchart.

Work by functional blocks in favour of the line by line approach.

Type in text and adjust for differences in screen format.

Study the documentation and listings carefully for aid.

Watch out for PEEKs and such, but don't give up if you see one.

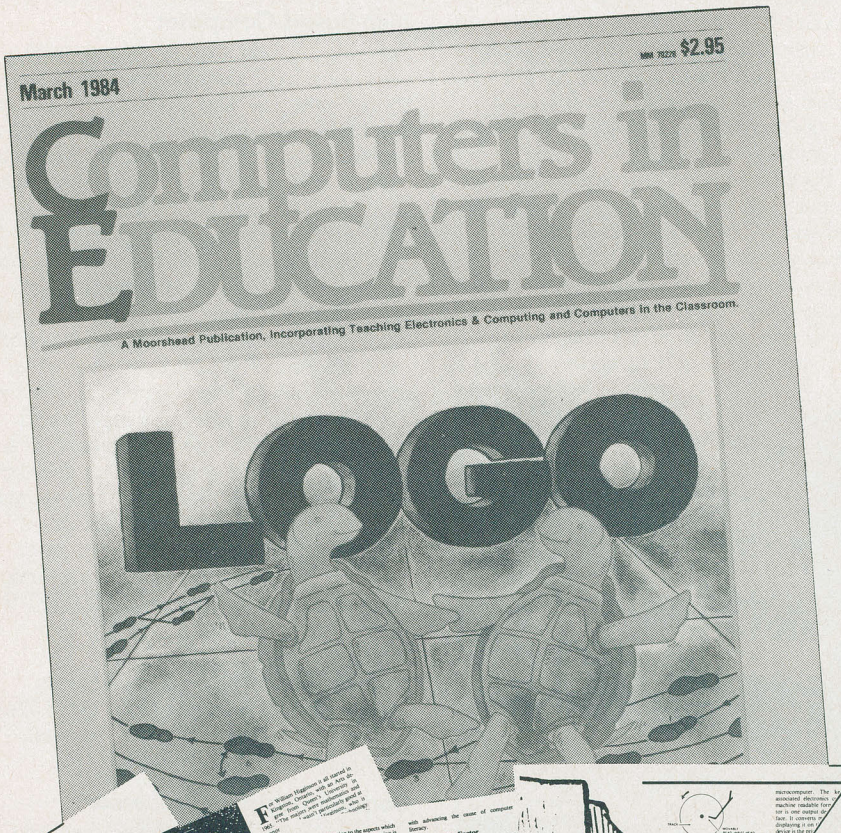
Be prepared to rewrite graphics.

Look for another way to do the job.

The three books previously mentioned are invaluable aids in this kind of endeavor, and can be found at local computer or book stores.

CN!

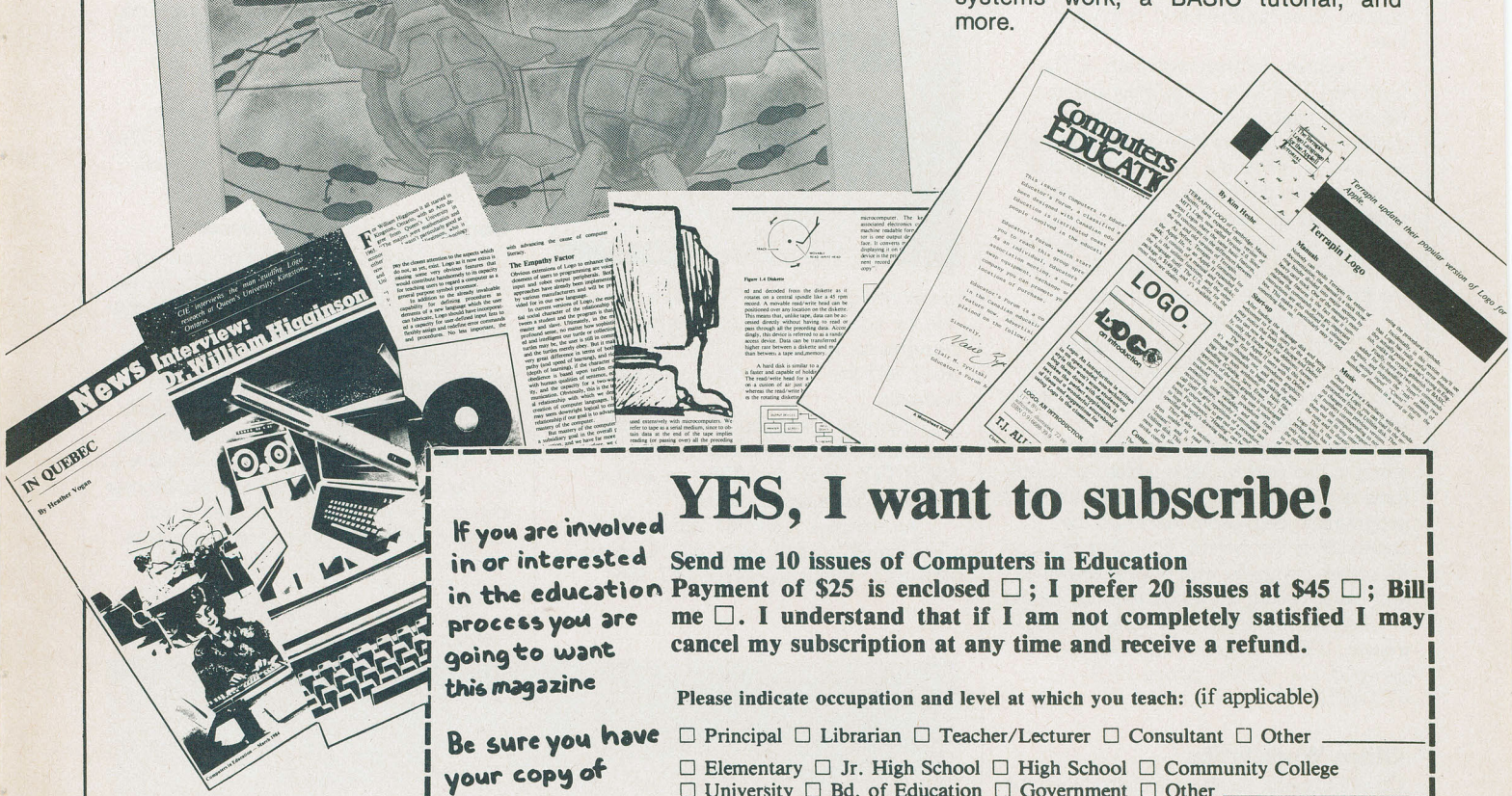
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There are news articles on the latest events and technology, beginner's guides to languages and software, software and book reviews, a build-it-yourself project, technical tips, and more.

In our first three issues, for instance, we covered the Icon educational computer and user's reactions to it, Logo, word processing for the classroom, simple cures for hardware problems, how disk systems work, a BASIC tutorial, and more.



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New Products

Graphics Package

Demco Electronics is marketing The Graphics Tool Kit ... a complete hardware-software package for generating a vast diversity of interactive graphics, using a screen area nine times larger than Apple's Hi-Res screen.

The CAD-capable system claims a resolution four and one half times sharper than now available with Apple II computers. It's compatible with all Apple IIs and most Apple-compatibles, and outputs to a dot matrix printer, eliminating the need for light pens, graphic tablets, mice, RGB monitors or plotters.

The proprietary hardware empowers users of The Graphic Tool Kit to design on a moveable screen with resolution of six hundred and forty horizontal dots by seven hundred and sixty-eight vertical lines. The viewing window is six hundred and forty dots by three hundred and eighty-four lines.

The main software program of The Graphics Tool Kit is completely menu-driven. It manipulates vector shapes, displays fonts, draws lines, plots points and will save or retrieve a drawing from disk. Other segments include a vector shape table maker and a font maker. For any given screen area, graphics are presented in four and a half times greater detail than the present Apple II hi-res screen.

The system drivers consist of the hardware interface, disk access commands and printer-dump routine. The sixty-four K of onboard memory frees both hi-res graphics pages for programmer's use.

The new package includes several ready-to-use vector shape tables and many fonts of different sizes. It also contains utility programs to help users maximize the capability of the system. The Graphics Tool Kit comes complete with sample drawings and blank vellum drawings with title blocks.

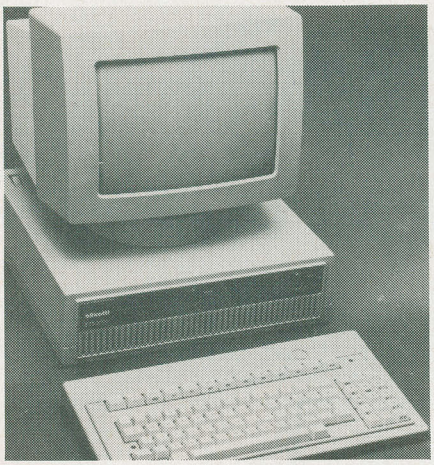
For information, contact Demco Electronics, 10516 Grevillea Avenue, Inglewood, Ca. 90304; phone (213) 677-0801.

Office Workstation

Olivetti Canada Limited was introduced the ETS 2010 multifunctional video typing system. ETS 2010 is an office automation workstation designed to deliver advanced word processing and business application capabilities in a flexible, easy to use package.

The system has a separated multi-language keyboard, a low profile drive unit and a screen that can be tilted and rotated for operator comfort. The ETS 2010 can be configured as either a stand-alone or as part of a cluster of as many as eight workstations. It uses a UNIX based operating system with optional access to CP/M-86 or MS-DOS, both offering an extensive library of applications software.

Specialized word processing software is document oriented, allowing continuous forward and backward smooth scrolling through an entire document. Exclusive features include windowing, for simultaneous viewing of up to four 'pages' from different parts of one or more documents; folding, which allows parts of documents wider than



the eighty character screen to be viewed side by side; automatic numbering of paragraphs; revision tracking; and undo, which let's the user cancel inappropriate revisions.

The new workstations have extensive communications capabilities including ASCII TTY, 3270 and 2780 emulation. For more information contact

Jan Adamek, Olivetti Canada Limited, 139 Don Mills Road, Don Mills, Ontario M3B 2X3. Telephone (416) 447-3351

Lisp-Based Computer

The LMI Lambda is an advanced, next-generation LISP machine that can be configured with LISP and UNIX co-processors in a high-speed, multi-processor bus. This configuration enables the two processors to execute concurrently, communicating with each other through LMI's extended STREAMS interface. A dual-processor LMI Lambda thus offers users the ability to add intelligence to an existing, traditional software package (operating in UNIX) by placing it under the supervision of an evolving LISP program. The LMI Lambda's virtual control store with microcompiler allows the machine's architecture to be rapidly and easily conformed to the requirements of a specific application, for increased efficiency and speed. The LMI Lambda also features an integral MULTIBUS, which allows system engineers a wide choice of lower-cost third-party peripherals for configuring the system, and an optional ETHERNET-II interface for communication with other computers.

For further information, contact Mache Creeger at LISP Machine, Inc., 6033 West Century Blvd., Suite 900, Los Angeles, CA90045. Phone: (213) 642-1116.

Communications Processor

The DataTalker II, a stand-alone, front-end intelligent communications processor, is no compatible with the IBM PCjr, according to Winterhalter, Incorporated.

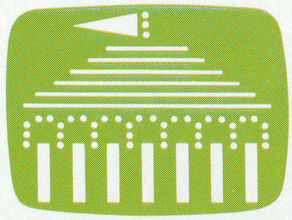
The DataTalker II plugs into the PCjr's RS-232 serial port, allowing the PCjr to emulate the IBM 3270 interactive terminals and the 3780/2780 remote batch terminals.

The emulation software is delivered with the DataTalker II on diskettes which the user then downloads to the DataTalker II unit, relieving the PCjr from all communications overhead and overload. The protocol is bisynchronous.

The software also includes an on-line communications trace that isolates line pro-



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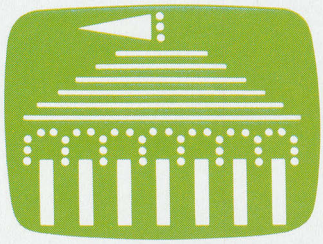


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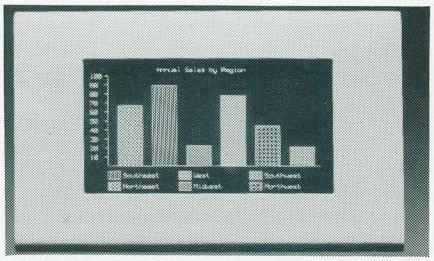
New Products

blems and eliminates the need for expensive diagnostic equipment. A separate off-line diagnostic program verifies the operation of the real time clock and the serial port when connected to a modem. The DataTalker II weighs under five pounds.
Further information on the DataTalker II is available from Winterhalter, Incorporated, Marketing Support Group, 3853 Research Park Drive, Ann Arbor, MI 48104.

Flat Panel Display

The first full size flat panel display using revolutionary AC and DC Plasma Discharge display technology was introduced today by Plasma Graphics Corporation. The product, the PlasmaGraphics 120, is twenty-five line by eighty character display that provides a combination of slim profile, readability, and graphics-quality resolution.

The PlasmaGraphics 120 is a fully graphic display providing one hundred and twenty thousand addressable pixels arranged in four hundred and eighty columns by two hundred and fifty rows. When addressed with a five by seven character matrix, the panel can display twenty-five lines of eighty characters. All electronics necessary to address and time the display are housed on an integral panel driver board. The display color is bright orange for easy viewing under high ambient light conditions, with display flicker or radiation emission problems.



For information on the PlasmaGraphics display, write to the Plasma Graphics Corporation, P.O. Box 4903, Warren, New Jersey 07060, or call (201) 757-5000.

Spare Change

Micron Distributing, a Canadian distributor for BRODERBUND, is pleased to introduce new game, Spare Change.

Spare Change casts the player in the role of an arcade owner who has just purchased a popular new game. The Zerks, the main characters of the game, have gone out of control and are running around the arcade trying to collect enough tokens to retire.

They must be distracted by using every trick in the book ... from playing their favourite tunes on the jukebox, to popping popcorn and using the pay phones.

If the player is thrifty and fast enough, Spare Change will go through a multitude of increasingly difficult levels of game play.

A unique feature of this game is the built-in "Zerk Control Centre" which allows the player to put the Zerks through a behavior modification program that dramatically alters their personality.

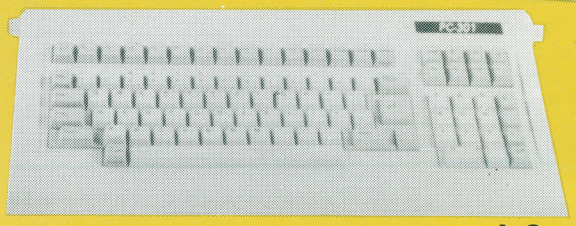
Spare Change is available for the Atari 400/800 and Apple computers. It is distributed through MICRON DISTRIBUTING and is available at your local computer store.

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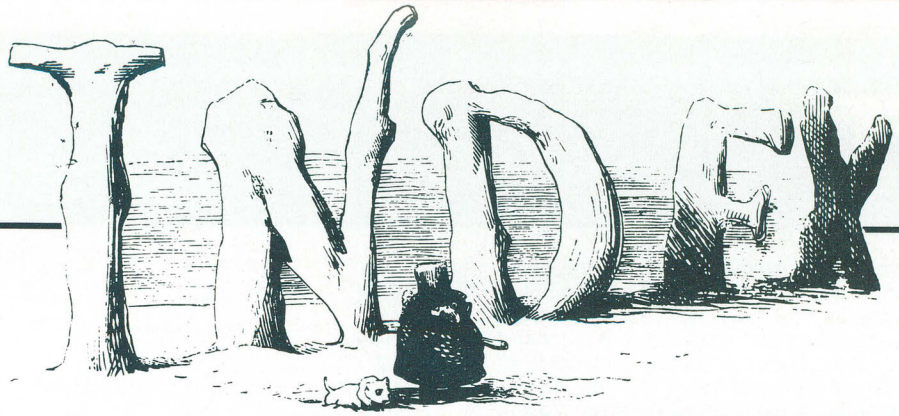
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VisiCalc
TRS-80 Six Pen Plotter Review
The RS-232 Port
Capacities of Systems
Introduction to WordStar
Apple Peripherals
Commodore 64 Review
Courses
A Roadmap to "C"
A Survey of Meaty Printers
ZX81 Large Keyboard
Apple Pirates

May 1983
Computer Music
CBM Peripheral Survey
An Introduction to ASM
Memory Systems
A Play With Prestel
The Japanese are Coming
Bionic Beaver Update
Kaypro Review
Telecommunications
Word Processing
Survey of Word Processors
Computers for the Hopelessly Confused
A Tale of Three Peripherals
Krazy Krypto Kreator

June 1983
Printer Survey
The Invisible Revolution
dBase II
The Joy of Sticks
Confessions of a Neophyte
Juice Your Apple
BASIC Graphics
Mountain Musick
CP/M in Ties
ZX Peripheral Survey
Columbia Review
Quicksort in BASIC
Sample ASM

July 1983
Videx Character Editor
COBOL: What is it?
64K on a ZX81
Picking an Accounts Package
TRS-80 Model IV Review
EPROM Deblaster
Bar Charts in BASIC
LPS II Light Pen Review
It Doesn't Work
Printer Survey
The Care and Feeding of PET
The Epic of BYE
Build it in the Boonies

August 1983
Alice in Hardware Land
Pilot
File Management Survey
Bubble Sort
Disk Systems
Toshiba T100 Review
Should I Computerize
The Legend of JLS
Commodore 64 Telecom Terminal
Survey of 64K CP/M 2.2 Systems
Lookup Tables
Gemini 10 Review
Pick Some Fruit
Computus Interruptus

September 1983
Survey of a Hundred Computers
All the BBS Numbers in the World
To Russia, With Silicon
Micron Eye Review
I Underscore my 64
Free Software
Customizing WordStar
No Micro is an Island
Monthly Amortization Chart
NCR Decision Mate Review
Things that go JMP in the Night
A Brush with VALDOCS
Pico Processor

October 1983
How May I Compuserve You
Racing Sprites
Micro Computers for Micro Users
All That Jazz
Vas Ist TurboDOS?
NEC Review
Un-TI Yourself
Buying a Printer for your Business
Operating Systems Explained
Survey of Video Games
Survey of Plotters
BIOS-Chemistry
Atari Subroutines
A Byte of Short Wave

November 1983
Of Mice and Modems
How to Buy a Business System
VIC Tricks
Survey of MS-DOS Systems
Computer Aided Drafting
Tunesmith for the IBM PC
Epson HX-20 Review
Free the MODEM 7
The SOURCErer's Apprentice
More Bionic Beavers
Unhook an Apple
Sweet P Review
ZCPR
TI Joysticks
Build a Modem
Survey of Apple DOCs

December 1983
Son of All The BBS Numbers In The World
What Is an IBM Clone, eh?
The Further Legend of JLS
Modem Survey
Lotus 1-2-3
The Submit Function
Echo][Review Review Review
Danger!
Pied Piper Review
SuperCalc at Work
Put Some Structure in your BASIC
The IBM PCjr
Accounting with Micros
Spreadsheet Survey
The Birth of a Dialing Terminal
Commodore 64 Sprite Editor
Stockboy Inventory Control Package
Spreadsheets for Idiots
Hard Disk-ussion

January 1984
Made in Canada
Logo
Survey of Apple Compatible Systems
Behind the Lisa
Apple Lisa Reviewed
Beyond BASIC
The Coleco ADAM
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The Micro Computer Keyboard Story
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Spirit 80 Review
Survey of Accounts Packages
Ten Tricks to Better Programming

February 1984
Apple Arcade
Survey of Monitors
A BBS in your Business
DOSDIAL
The Zorba
Machine Language on the IBM
ORGANize Your Apple
The Gemini Within
The Electronic Office Returns
The Macintosh Revealed
Polish That Buffer
RAM Your VIC
Business Graphics Packages
The Morse Fruit
Passing Parameters in Microsoft BASIC

March 1984
Computers In Concert
Koala Pad Reviewed
A Few Of Our Favourite Things
Apple In The Sky
Dedicated Terminals
The Key To The IBM
Multi User Systems
The Best Reviewed
Vic Routines and More 64
Skyhook Your Apple
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The CP/M Menu
The Very Last Apple Unhook
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CN!

LIST

Most computer users have at least one major project in the works and we have all experienced the odd sensation of coming out of an analytical fog to discover that the sun is just peering over the rooftops and the night has been spent in revisions. It is for this reason that small programs exist. They can't simulate attacks from the Crab Nebula or figure out the exact value of Pi but they're fun, or clever or just diverting. On these pages we present some of the programs submitted by our readers or dreamed up by ourselves. . . after giving up on the software for the matter transporter.

Readers are invited to submit programs for LIST!. They should be printed out with a reasonably new ribbon. . . we cannot accept hand written or hand typed software. . . and of a length that can be dealt with in one printed page or so (or less). We suggest that the author's name and address appear somewhere in the listing. We pay for programs on publication.

Lightpen Organ

by Tony Savor

A music editor for the Vic-20, this program requires a lightpen to work properly.

```
0 REM LIGHTPEN ORGAN  FOR USE ON THE        COMMODORE VIC-20      COMPUTER
1 REM BY TONY SAVOR   1998 GLENDALE DR.     PICKERING ONTARIO
2 REM DECEMBER 1983.
3 REM TO TYPE IN THE  SPECIAL CURSOR        CONTROLS IN THE SQUAREBRACKETS JUST
TYPE
4 REM THE INSTRUCTION THEY GIVE FOR EXAMPLE IF IT SAYS [HOME] HIT THE CLR/HOME K
EY OR
5 REM IF IT SAYS      [2 RIGHT] THEN HIT THECURSOR CONTROL KEY     THAT WILL MAKE
 THE
6 REM CURSOR GO RIGHT-HIT IT TWO TIMES.
7 REM DO NOT TYPE THE BRACKETS OR THE       COMMANDS IN THE       BRACKETS DIRIE
CTLY.
19 POKE36878,15:PRINT"[CLR]":POKE36879,8
20 PRINT"[WHT][RVS][17 DOWN][12 RIGHT]PLAY"
21 PRINT"[HOME][RVS][21 DOWN]SOUND OFF"
22 PRINT"[RVS][HOME][12 DOWN][5 RIGHT]NEW"
23 PRINT"[HOME][RVS][15 DOWN][8 RIGHT]STOP PLAYBACK"
25 PRINT"[HOME][WHT][RVS][16 DOWN][2 RIGHT]REST"
30 PRINT"[HOME]";
31 FORT=0TO20STEP2
32 PRINTTAB(T)"[RVS][SPACE]"
33 NEXT
40 X=PEEK(36871)
50 READD,F,G:IFX<DTHEN70
60 IFX>FTHEN70
61 IFX=JTHEN40
62 IFX<>JTHENPOKE36876,0
65 IFG=300THENL=828:GOTO40
66 IFG=400THEN300
67 POKE36876,G:J=X
68 POKEL,G:L=L+1:IFL>1019THENPOKE36877,234:FORT=1TO1000:NEXTT:POKE36877,0
69 IFG=1THENPOKE36874,232:FORT=1TO300:NEXTT:POKE36874,0
70 IFD=256THEN RESTORE:GOTO40
80 GOTO40
100 DATA26,29,225,30,33,228,34,37,231,38,41,232,42,45,235,46,49,237,50,53,239,54
,57,240
110 DATA58,61,242,62,65,244,66,69,246,70,73,248,110,199,0,97,100,400,74,77,300
111 DATA90,93,1,256,256,256
201 PRINT"[HOME][20 DOWN][17 SPACES]"
202 PRINT"[HOME][20 DOWN]";PEEK(36870);PEEK(36871):GOTO201
300 P=828
301 W=PEEK(P):IFW=0THENPOKE36876,0:GOTO40
310 POKE36876,W:FORT=1TO500:NEXTT:POKE36876,0
320 P=P+1:GOTO301

READY.
```

Chase

by Ken Fast

A form of competitive computing for the TRS-80 models I and III, this short game pits a cursor against you.

```
1 REM CHASE
2 REM BY KENT FAST
3 REM FOR THE TRS-80 MODEL I + III
4 CLS:PRINT "THE OBJECT OF THE GAME IS TO KEEP YOUR CURSOR AWAY FROM THE"
5 PRINT "CURSOR THAT IS CHASING YOU FOR AS LONG AS POSSIBLE.  YOU GET"
6 PRINT "POINTS FOR HOW LONG YOU KEEP ALIVE, FOR EACH DOT ON THE SCREEN,"
7 PRINT "AND FOR EACH BLOCK OF SIX DOTS ON THE SCREEN.  YOU START IN THE"
8 PRINT "BOTTOM RIGHT HAND CORNER, AND THE CURSOR CHASING YOU STARTS IN"
9 PRINT "TOP LEFT HAND CORNER."
10 INPUT "ENTER NAME";P$
16 X=127:Y=47:X1=0:Y1=0
17 T=0
20 CLS
30 X=127:Y=47
40 P=PEEK(14400)
50 IFPAND64THENX=X+3:IFX>127THENX=127
60 IFPAND32THENX=X-3:IFX<0THENX=0
70 IFPAND16THENY=Y+3:IFY>47THENY=47
80 IFPAND8THENY=Y-3:IFY<0THENY=0
90 T=T+1
100 IFX1>XTHENX1=X1-2:IFX1<0THENX1=0
110 IFX1<XTHENX1=X1+2:IFX1>127THENX1=127
120 IFY1>YTHENY1=Y1-2:IFY1<0THENY1=0
130 IFY1<YTHENY1=Y1+2:IFY1>47THENY1=47
140 IFY1=YANDX1=XTHEN500
150 SET(X,Y)
160 SET(X1,Y1)
170 GOTO40
500 REM  *CALCULATE AND PRINT OUT SCORE*
510 FORI=15360TO16383
520 IFPEEK(I)<>128THENT=T+1
540 IFPEEK(I)=191THENT=T+5
550 NEXTI
560 CLS
570 PRINT P$
590 IFT>TTTHENTT=T:TP$ = P$
600 PRINT"YOUR SCORE:"T
610 PRINT"HIGH SCORE:"TT"      "TP$
620 INPUT"HIT ENTER TO PLAY AGAIN. . .";Z$
630 GOTO 10
```

Drawing Pad

by Ken Fast

A screen graphics editor for the TRS-80 models I and III.

```
1 REM DRAWING PAD
2 REM BY KENT FAST FOR THE TRS-80 MODEL I + III
3 CLS:PRINT "USE TO THE ARROW KEYS TO MOVE THE CURSOR AROUND THE SCREEN."
4 PRINT "PRESS THE SPACE BAR TO SWITCH FROM DRAWING MODE TO ERASING"
5 PRINT "MODE, OR FROM ERASING MODE TO DRAWING MODE."
6 INPUT "HIT ENTER TO START. . .";Z$
10 CLS
20 P=PEEK(14400)
30 IFPAND64THENX=X+1:IFX>127THENX=127
40 IFPAND32THENX=X-1:IFX<0THENX=0
50 IFPAND16THENY=Y+1:IFY>47THENY=47
60 IFPAND8THENY=Y-1:IFY<0THENY=0
70 IFINKEY$=" "THEN100
75 IF INKEY$ = "P" THEN 1000
80 SET(X,Y)
90 GOTO20
100 RESET(X,Y)
110 P=PEEK(14400)
120 IFPAND64THENX=X+1:IFX>127THENX=127
130 IFPAND32THENX=X-1:IFX<0THENX=0
140 IFPAND16THENY=Y+1:IFY>47THENY=47
150 IFPAND8THENY=Y-1:IFY<0THENY=0
160 IFINKEY$=" "THEN20
165 IF INKEY$ = "P" THEN 1000
170 SET(X,Y)
180 GOTO100
```

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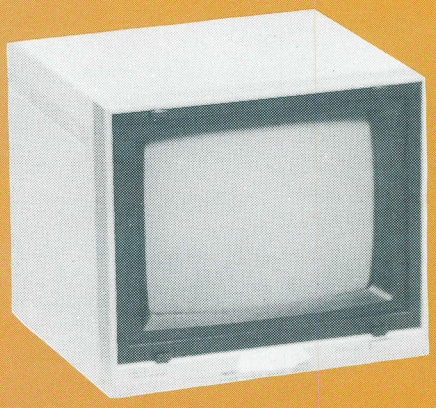
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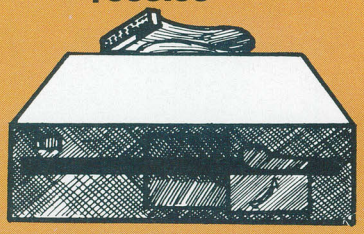
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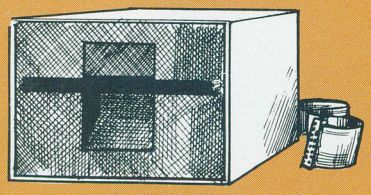


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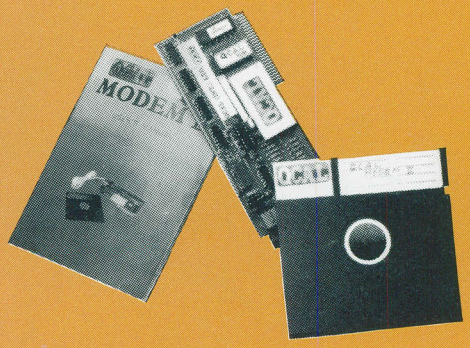


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